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CORN CROP STOOKED, QUEENSLAND AGRICULTURAL COLLEGE.

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(*Abridged from the Courier.*)

THE Minister for Lands and Agriculture (Hon. J. V. Chataway), accompanied by a number of members of both Houses of Parliament, paid a visit to the Queensland Agricultural College on the 10th December. Among the company were—Hon. D. H. Dalrymple (Minister for Public Instruction), Hons. A. H. Barlow, J. C. Heussler, R. Bulcock, P. Perkins, J. Thornloe Smith, J. Deane, W. F. Lambert, M.M.L.C., Hon. A. S. Cowley (Speaker of the Legislative Assembly), Messrs. Story, W. J. Ryott-Maughan, Stodart, Daniels, W. Castling, R. H. Smith, G. Thorn, J. Newell, A. J. Stephenson, M. Battersby, R. King, J. McMaster, T. Bridges, M.M.L.A., Rev. G. Woolnough, R. King (Under Secretary to the Treasury), J. Gordon (Chief Inspector of Stock), J. F. Thallon (Deputy Railway Commissioner), F. X. Heeney (Under Secretary to the Lands Department), P. McLean (Under Secretary to the Department of Agriculture), W. J. Mahony, J. Wilkinson, Major Boyd (Secretary to the College). The party left the Central Station by special train shortly after 9 o'clock, and on arriving at the station adjacent to the College they were met by the Principal (Mr. J. Mahon), and driven in various vehicles to the institution. The interval between then and lunch was pleasantly and instructively occupied in inspecting the cultivation, the College herd, the dairy, and the College buildings. Those of the visitors who had not been to Gatton before were agreeably surprised at what they saw—at the extent of the cultivation, the healthy and forward appearance of the crops, the order and system observed everywhere, and the excellence of the appliances and the buildings provided for the College work. In one of the fields ploughing was in progress, and the temptation to some of the visitors to take a hand in it was too strong to be resisted. The less energetic of the company had the pleasure of witnessing an improvised ploughing match, in which Mr. McMaster and Mr. R. H. Smith, MM.L.A., were the chief competitors. Both Mr. McMaster and Mr. Smith showed that, so far as ploughing was concerned, their hands had not forgotten their cunning. They were not heard, however, to express any regret that ploughing did not now form one of the ordinary occupations of their daily life. After this short stoppage the party visited the strawberry garden, and regaled themselves with such fruit as they could find. The strawberries proved not to be very large, but of pleasant flavour.* While driving along, the excellent appearance of the maize was the subject of common remark. Other crops also bore witness to the care and attention bestowed upon them. The visitors had not the advantage of seeing the students at work, for, though a few of them were in the fields, the majority of them were indoors when they arrived. Such of the students as were encountered were courteously helpful wherever they could be. Some trace of feeling with regard to the sensational events of some little time ago was perceptible in their conversation. One or two of them seemed to think that outside the students generally were regarded as very sad fellows, and they seemed to be smarting under some sense of injustice. There was nothing, however, in their demeanour or behaviour to suggest that they were otherwise

* The strawberry season was over in November.—Ed. *Q.A.J.*

than well-disposed, industrious, and manly youths. The boisterous conduct so frequently indulged in by university students on occasions when the public are brought in contact with them—as, for instance, commemoration days—was entirely absent. The Principal, in his speech after luncheon, claimed that the students were hard-working, and were all likely to turn out good practical colonists. So far as a casual visitor could judge, there was nothing to show that he claimed too much for them.

Luncheon was provided in the workshop, situated under one of the dormitories. This proved a cool and agreeable dining-hall, and the luncheon provided was done full justice to. The company, all told, numbered seventy-three or seventy-four. After lunch a short while was devoted to speech-making. The toast of "The Queen" having been duly honoured,

The Hon. J. V. CHATAWAY proposed the toast "Success to the Queensland Agricultural College." He said the College had gone through a time of some difficulty. He was not sure that the difficulties were over, every one of them, but they very much hoped they were. They hoped to get round them in this institution as teachers, headed by the Principal, a body of men who were workers. (Hear, hear.) They wanted men, and they were determined to get men, who knew their work, and would put their hands to it, and carry it through in spite of all obstacles. (Applause.) The College, he believed, in a very few years' time would be the pride of the colony. (Hear, hear.) They had not at the present time so many students as they would like to have. Those that were left, after sundry little disagreements that he would not allude to, were the pick of the bunch. They were workers, and he could assure his hearers from his personal knowledge that nine out of every ten of them would turn out first-class, useful colonists, able to turn their hands to anything in connection with the house or in connection with the farm. (Hear, hear.) It was somewhat disheartening, after the Government offering bursaries to the College, for some reason or other those bursaries, which offered to the students who won them a free education for a matter of three years, had practically had no applicants for them. It might be that the advantages of the College were not widely enough known. (Hear, hear.) If that were so, he trusted that those who were there now would spread far and wide what they had seen of the College and of the work done there. (Hear, hear.) It might appear to some of them that a very great deal of money had been spent, and he could assure them that a great deal of money would have to be spent to carry out the work of the institution. The dairy they had only just got into working order. They would agree with him in considering the teaching of practical dairying one of the most important and one of the most fruitful of educational forms in the colony. (Hear, hear.) Now they had got it into working order, they would be able to send to the exhibition at Earl's Court, in London, weekly shipments of butter, to be placed in the refrigerating chamber and shown alongside the meat from this colony, to show the public what we could do here. (Hear, hear.) There was going to be a very big show next year in London. The colony had secured 10,000 feet of space, and they hoped to make a display which would be creditable to the colony, and would be an admirable advertisement of our resources. He hoped to see the Agricultural Department extremely well represented there. He had no hesitation in asking them to drink with him success to the Agricultural College and its masters, and more especially he asked them to wish success in his arduous and uphill fight to John Mahon, the Principal. (Applause.)

Mr. MAHON, in responding, said he knew he had an uphill battle to fight, but he had a class of students to deal with who were a credit to their parents and a credit to the colony. In dealing with them he trusted to their sense of honour, and he had found that he could do that safely. Out of the thirty-six students he had now, there was not a bad one. About six months ago he took charge of the institution, under very adverse circumstances, but he had had a thorough successful half-year. Some of the criticism which some of the students had been subjected to had done a good deal of harm to the College.

It had been suggested that the class of young men they had there were larrikins and blackguards, but he emphatically denied that that was the case. They had in the College, as he had said, a class of young men who were a credit to the colony. A great deal of work had been done during the six months, and at the start they had a great deal of labour in preparing the land for seed owing to the amount of weeds with which they had to contend. All the land was ploughed three times, thus entailing an expenditure of about 35s. an acre. Next season they hoped to plant the seed at half the cost. The land at present under cultivation cost about £300 to prepare it, that amount including ploughing, harrowing, sowing, and keeping clean. The work of the half-year in farming, dairying, and gardening was as follows:—61 acres maize, 6½ acres wheat, 6½ acres oats, 16 acres cowpea, 21 acres sorghum, 4 acres imphee, 1 acre field peas, 1½ acre tobacco, 4 acres panicum, 2 acres haricot beans, 4 acres sorghum, amber cane, panicum, 35 acres pumpkins (sown with late corn), 1 acre mangold, ½-acre carrots, ½-acre turnips, 13 acres potatoes (fifteen varieties), 1½ acres strawberries, ¼-acre pineapples, 4 acres general garden, 5 acres fruit trees and grape vines, thirty varieties grasses and clovers; total under cultivation, 154½ acres; 35 acres fallowed, 101 acres being cleared for next year. It might be a bold assertion to make, but he was satisfied that within the next eighteen months the College would be made self-supporting; and that would be done without in any way detracting from the tuition of the students. (Applause.) Coming now to the dairy, he regarded the branch of industry which it represented as one of the most important industries of the colony. (Hear, hear.) The dairy, including pigs, had shown a net profit of £168 6s. 10d. for four months and one week. (Applause.) At the present time they were netting £2 1s. 10d. per day from fifty cows, that amount being exclusive of the return from pigs, which were fed from whey and separated milk. He did not think it was the desire of the Government to make the College self-supporting, but what he maintained was that if they could show to the students that they were making a profit from the farm and dairy they would be more anxious to go in for the business themselves. (Applause.) They had seen the dairy, and he thought they would all admit that, when completed, it would be one of the most perfect little dairies in Australia. They were now making their own butter and cheese, and next term they would make their own bacon. They also intended to manufacture butter and cheese on the most improved methods for export. In his opinion, the tuition of the College could be made more beneficial to students if more practical work was done. Under the present system it would require many years to turn out a practical farmer or dairyman, unless students were allowed to take up special subjects. For instance, under their system, or the system set down in the College calendar, a student only got three days' practical farm work in each month, or eighteen days in six months. Now, every practical man knew very well that very little could be taught in eighteen days, yet some of the students, and, indeed, parents also, had an idea that six months' tuition should be sufficient to turn out practical farmers and dairymen. He considered that better arrangements could be made for carrying on the scholastic and practical duties, and he further thought that parents should have the privilege of sending their sons to take special courses in any of the subjects taught at the College. He had had letters from, he supposed, 45 per cent. of the parents of the students, asking that their sons might be allowed to take up practical subjects, such as farming and dairying, but under the present system they were unable to comply with their requests.

The Hon. A. H. Barlow: How is it they get so little outdoor work?

Mr. Mahon said that students, in the first place, were sent to the mechanical master for three days in one week, the next week they were sent to the dairy, the third to the horticulturist, and the fourth week to the farm foreman. The rest of the time was occupied by the other tuition given in the College, so that practically the students only got three days' practical instruction in farming in each month.

The Hon. A. S. Cowley proposed the health of "The Minister for Agriculture." He said they had all been very much pleased by what Mr. Mahon had said. He had been very much surprised to hear the College was actually making the large amount that Mr. Mahon said it was doing. He was sure it was very gratifying information. He hoped that a report would be submitted to Parliament periodically, showing all these matters, and showing how the profit was being made. If that was done, he was sure there would be a great many more students. He was also very pleased to hear such a good character of the students. They all knew Queensland boys were equal to any other boys, and when it came to downright hard work he did not believe they would shirk it. He believed Parliament was disposed to deal with this institution in no niggardly spirit. If the College proved a success, he was satisfied other institutions of a similar kind would be established in other parts of the colony. They were pleased to hear what had been done, and they would be much more pleased when the time arrived that the institution was a paying success. (Applause.)

Mr. Chataway, in responding, said Queensland was looking to this institution to prove that agricultural colleges could be successfully carried on. (Hear, hear.) He hoped that they would avoid the errors and mistakes that had been made by similar institutions in other colonies. He had found students from other colleges coming to this colony, who after three half-years of work claimed to be proficient in at least fourteen or fifteen different subjects, each of which would take over four years to learn completely. What the Principal proposed to do here was to avoid that sort of thing. He desired that they should go in more for specialising—that those boys, for instance, who wished tuition in chemistry should be able to take it in the splendid laboratory they had, and under the excellent head of that laboratory; that those boys who had a taste for dairying should be allowed to devote the greater part of their time to making themselves thoroughly proficient in that branch of agriculture; that those students who desired to take up market gardening should be allowed to place themselves more completely under the instruction of the horticulturist, who was a practical and efficient market gardener himself, and so learn as much as could be learned on that subject in the three years. That briefly was the position which the Principal desired the department to take up with regard to the working of the College. He hoped that when students left it they would not be lost sight of; that when they wanted employment they would be able to recommend them to it, and be able to recommend them with the certainty that they would do justice to the teaching they had received. He hoped also that when a student left and desired to find employment they would be able to find employment for him. He trusted that that would add to the attractions of the College, and that students would find that, instead of it being a detriment to them in getting employment, it would prove an advantage to them to have passed through it. (Applause.)

The remainder of the afternoon was chiefly spent in resting under the cool shade of the College verandas. The party reached town again at about 7·30 o'clock in the evening.

The Labour Question.

There is no disguising the fact that the difficulty with regard to labour this crushing season is important in every sugar district of the colony. We admit that the crop is generally abnormally good, so far as the amount of cane to be taken off is considered, but there is no reason to suppose that smaller crops in the aggregate will be produced during the next few years. One thing only can reduce the acreage now under cane. If the lack of labour, which is so

prominent this year, continues, then farmers will have to restrict the acreage they cultivate, for the simple reason that a large area means probably a considerable percentage of cane being left on the ground. The lesson this year will be a severe one. Not that the acreage left uncut will probably be very much greater than in some previous years, but the crops being very much heavier the amount of cane left uncut will be a more serious item than hitherto. As we approach the termination of the season it is daily becoming more evident that the whole of the crops cannot be taken off, unless indeed we have suitable weather at least to the middle of January, and it is hardly reasonable to expect this. Our crushing season is ordinarily considered to last, according to locality, from May to January, and this would be ample to take off the present full crop, if there was sufficient labour to enable the farmers to supply the cane, and the mills to carry on work, uninterruptedly day and night. As it is, several mills we are aware of have been unable to maintain steady day and night work, and anything short of this is not payable in the present day of low prices and small economies. It surely requires no demonstration to show that we cannot now afford the losses which follow upon delays in the mills, and the general disorganisation once a day of single-shift work. But the mills cannot work without labour, nor can they work without full supplies of cane, and the farmer cannot give the latter if he has not the labour to cut the cane, load it on to drays, tramways, or railways, and cart it to the mills. Yet this is the present position. Every human being of whatever colour is being pressed into the work of harvesting; yet still there are not enough. It cannot be said to be a question of wages, for wages are not the essence of the difficulty. Farmers call for tenders, and though the tenderers can state any price they choose, and the farmer would perforce pay such prices, the men are not forthcoming to offer to do the work at their own prices. This is a clear and indisputable fact, and politicians who rave on the subject of their being plenty of European labour for the sugar industry must make the best of it. There is not enough labour—that is the point. It must be admitted that the sugar industry does not employ a very large quantity of casual labour during the ordinary season—that is, the first six months of the year; but during the balance of the year it will take on every man who will work, and at good wages too. Yet these men are not forthcoming. We put on one side all the reports that such men as are available have been causing trouble through laziness and insobriety. Such, unfortunately, always seems to be the case where labour is scarce, and it is probably natural. When labour is difficult to get, the employer must take any man who is willing to engage, and the result is that until he has taken on the most useless of men he does not realise that the labour market is depleted. Yet so it is, and he has on his hands a few good, steady workers, but many absolutely worthless. If the sugar industry is to maintain its own, much more expand, some remedy must be found for this state of affairs. Hitherto we have appealed in vain to the Government and the country. A section of our politicians do not want, apparently, any labour to come into the country which will compete with that already here. It is a dog-in-the-manger policy. There is more work than local men can do, yet they object to others taking what they themselves cannot compass. New Guinea labourers, brought over for the crushing season only, and then deported home again, would meet the difficulty to a large extent, and at anyrate prevent the importation of Japanese, which is admitted on all sides to be justified only by the absolute necessity of the case. But if the country will not come to the assistance of the sugar-growers, then it seems to us there is one course open, a course which will certainly not win for us the thanks of the mother colony of New South Wales, but which may at any rate relieve the necessities under which we labour. Cane-cutters on the New South Wales rivers largely come from Sydney. They go up on to the rivers annually and cut cane, making a regular harvest season of the outing, and then returning to the metropolis. Queenslanders will have to take a leaf out of the book of the Colonial Sugar Refining Company. That

corporation advertises yearly for men, naming the day on which the cutters and mill hands will be engaged. We can do something similar. Combination amongst ourselves is required, and, this secured, an office should be opened in Sydney, and possibly in Melbourne, where cane-cutters and mill hands can be engaged, a large number being brought up in a body, and dropped at the different sugar district ports along the coast, their passages home again being guaranteed if they work through the season.* This plan was successful in the shearers' strike in 1891, and there is no reason why the same system should not find adoption here. It may be argued that there are many reasons against this course of action, but they all stand nullified by the fact that no action on our part means ruination to the farmers and the millowners. If a better plan is forthcoming, we are prepared to hear and welcome it.—*Mackay Sugar Journal.*

* If an office as here suggested were opened in Brisbane and another in Rockhampton, say, and the same facilities offered to our own people temporarily out of work, perhaps the desired amount of labour would be forthcoming. It is the want of means and the uncertainty of getting work which prevents scores of men going to the sugar districts who would gladly do so for the season.—ED. *Q. A. J.*

Agriculture.

TOBACCO.

Mr. NEVILL, Tobacco Expert, says that it is not at all necessary, nor is it a good thing, to select the richest lands for tobacco-growing. A soil which will produce a splendid crop of maize, potatoes, lucerne, or sugar-cane is not necessarily a soil which will produce a good tobacco. In the United States, tobacco is grown on lands which would not be thought worth cultivating in Queensland. The best soil for tobacco in Florida is a grey sandy loam, underlaid by a stiff red or yellow clay sub-soil. Such land will require manuring.

But what is the proper kind of manure to use? In Florida they say the best fertiliser is cotton-seed crushed and cotton-seed meal—the latter giving the plants a quick start; the former, by its slower action, feeding the plants at a later period and sustaining them during the important crisis of leaf formation. About 80 to 100 bushels of crushed seed and 500 lb. to 800 lb. of the meal should be applied per acre. On land thus fertilised, the Sumatra tobacco yields on an average 800 lb. per acre, but as much as 1,300 lb. have been harvested on small, well-tilled holdings. Cuban tobacco will yield from 500 lb. to 900 lb. on an average; the latter yield is, however, exceptional.

At the Queensland Agricultural College, Mr. Nevill is experimenting on two different soils—one a heavy, deep, rich black loam; the other a poor, sandy, shallow soil, overlying a rocky bottom. Unfortunately, the weather since and during the planting-out time was exceptionally dry, and a large proportion of the plants failed, but a good many are growing, and the gardeners are busy planting up the misses.

The analysis of a perfect tobacco fertiliser should be 10 to 12 per cent. potash, 8 per cent. phosphoric acid, and 4 per cent. nitrogen. A Jamaica paper says that it is quite impossible to get this analysis outside a mineral fertiliser. We are not aware whether Mr. Nevill has used any fertiliser on the poor soil; but if not, probably next year, when the soil has been analysed, and when it is seen what the yield on the unfertilised land is like, he will turn his attention to experiments in this direction, although we know that he does not favour the use of fertilisers in tobacco-growing.

If fertilising can be done cheaply, then there are thousands of acres, close to our largest cities, and on the railway lines and rivers, which may yet be turned to account as tobacco plantations.

THE CULTIVATION OF CHILIES.

WE (*Tropical Agriculturist*, Colombo) are induced to refer to this subject after having watched the result of chili cultivation by a planter, as a catch crop in land planted with coconuts. The returns in this particular instance, where the land was but lately reclaimed from forest, were so large that to mention figures would be to test the credulity of most people. The same enormous profits cannot of course be expected from all soils, but it at least implies the certainty that chilies can be made to yield a very substantial return on almost any soil.

While travelling from Madras to Tuticorin, after a trip across the Deccan some five years ago, we were astonished to see the extent of land laid under this crop, and the enormous loads of dried chilies that were being shipped from Tuticorin suggested the question: Why cannot also Ceylon carry on an export trade in this commodity? The fact, of course, is that, so far from Ceylon exporting, it draws practically the whole of its supply of chilies from India. This is all the more astonishing, considering the great possibilities that exist in Ceylon for raising the crop in question and the facilities for marketing it.

Indeed, it strikes us that the chili plant is perhaps more than any other adapted to the conditions of rural cultivation in Ceylon. It is a crop that requires little attention after having once settled in the soil. It has no enemies to speak of, and the peripatetic Moorman is always at hand to take over the produce without any after-treatment on the spot. All these circumstances greatly favour the adoption of the chili as a crop for native cultivation.

We are aware that chilies are grown to some extent by the Sinhalese and particularly by the Tamils of the North, but such local produce is chiefly consumed in the fresh state. The largest demand for chilies is in the dry and not the fresh condition, for the preparation of a "curry stuff" by grinding into a paste, and in this connection local produce is of little if any account. Why is it that the plant is not grown more extensively for supplying our markets with the dry chili of commerce?

The *Kew Bulletin* for July last has a paper on chilies which contains some interesting facts and figures.

We learn that about 100 tons of dried chilies are imported every year into England from the West Indies and the east and west coast of Africa. The prices fetched according to colour and pungency varies from £1 to £2 per cwt.

Mr. Consul Cave, reporting on the trade and commerce of Zanzibar for 1897, says that the production in that island was over 276 tons. The variety cultivated in Zanzibar for export is said to be *Capsicum minimum*, Bird's-eye Pepper, the Sinhalese nayi-miris, which forms the basis of cayenne pepper.

From Natal the chilies exported are a variety of *Capsicum annum*, which is also used for cayenne pepper. The Nepaul chilies, also a variety of *C. annum*, are the most esteemed for cayenne, owing to their violet odour when ground to powder.

The *Saturday Review* refers to two preparations of chilies in vogue in South America. In the case of the one, the pods are freed from seeds, ground to a paste, and in this condition packed in well-dried gourds about the size of an orange [or would it be the calabash fruit] prepared for the purpose. The gourds are sealed over with clay and put in the sun to "ripen" When ready for use, these "spurious fruit" are said to have an "exquisite flavour and refined taste." In the second method of preparation the seeds are also taken, so that the paste is more pungent and is cooked as a condiment with other foods such as Indian corn. These preparations of chili, called "aji," when specially made with an admixture of delicately scented bark or other substance, is said to be looked upon as a most acceptable gift in the country of the Incas. Apart from its use for cayenne pepper, chili is also employed in medicines and as a food for birds to improve their plumage, for which purpose there is a very large demand. Dr. Watt remarks that there is great confusion in the nomenclature of the chilies. He names four species: *C. annum*, *C. frutescens*, *Capsicum grossum*, and *C. minimum* (*C. fastigiatum*).

All these species, of which there are many varieties, are represented in Ceylon. The first by the superior full fruits found in our markets; the the second by the long, pointed (generally) curved chili; the third by the largest variety, with thick fleshy skin and little pungency, generally spoken of as "capsicums"; and the fourth by the Sinhalese nayi-miris.

Dr. Morris, in his Catalogue of Ceylon Plants published in Ceylon, gives the following with reference to chilies:—1. *Capsicum frutescens*, var. *rubrum;* Red Chili (ratu-miris), var. *luteum;* Yellow Chili (gas or kaha-miris), var. *atrum;* Black Chili (kalu-miris). 2. *C. annum*, Guinea pepper. Rata-miris, a variety (olive chilies) being called kalu-miris.

Nearly 1,000,000 rupees' worth of "curry stuffs" are imported annually from India, and a good part of this in the shape of dry chilies, the production of which should be encouraged in every way in Ceylon. We trust the newly formed Agri-Horticultural Society will see its way to offer, or induce Government to offer, rewards for the largest acreages of cultivated chilies, and for the best commercial samples of dried chilies.

[The above remarks on chili-growing should induce someone to make the experiment of growing chilies for export, in Queensland. The plant grows to the greatest perfection in all parts of the colony, and bears heavily for many months. Nearly all the varieties are to be found here. A sample bottle of pickled chilies was sent from London to the Department of Agriculture lately, with an intimation that chilies put up in that form would be readily saleable in London. Those interested can see the sample at the Head Office.—Ed. *Q.A.J.*]

HOW TO BUILD RICKS.

By JOHN MAHON,
Principal, Queensland Agricultural College.

BEFORE placing the material in the rick it must be thoroughly dry, as also any green weeds or grass that may be in the sheaf. Stacks may be built as long ekes or round stacks, the long preferable. One large rick is better than many small ones, as there is less exposure and less loss. The slovenly methods adopted by many farmers in building ricks should be discontinued. Large sums of money are lost annually in this colony through carelessness or want of knowledge in this respect, through the grain becoming damaged during wet weather.

In commencing a rick, the area on which it is to be built should be lined out, and the work begun by forming a stook or cone in the centre, and the sheaf kept gradually inclining downwards towards the outside of the stack, with the ends directed outwards. The middle should always be kept full, and higher than the outside. If this rule be adhered to, there will be no danger of the rain penetrating, as it will be carried off by the straw without doing any damage.

The builder must do the work on his knees, and the boy, or assistant, should place each sheaf within easy reach to enable him to pack the sheaves as closely as possible. In the absence of the carters, the builder should be on the ground beating in the ends of the sheaves that may be projecting, as by paying strict attention to this matter the rick can be kept as perpendicular as the walls of a house. The assistant should keep the stack well tramped down. The height of the rick to the eave should be from 8 feet to 10 feet. When this height is reached, and to form the eave, one row of sheaves should be allowed to project about 3 inches, after which the builder should begin to draw in each row of sheaves slightly so as to form a pitch similar to that of a pitched roof, until the rick has narrowed to the width of a sheaf on top. If the rick is to be held over for a long period, I would certainly advise thatching.

MARKET GARDENING, No. 2.

BY H. W. GORRIE,
Horticulturist, Queensland Agricultural College.

THE KIND OF SEEDS TO SOW.

HAVING prepared the soil, and decided upon what to grow, and marked out the ground in sections for the different crops, the next most important question is that of

SEEDS.

Seeds to be profitable must be of first-class quality, and it will be found cheaper in the end to pay a good price for good seeds than to buy inferior rubbish, which is dear at any price.

Always purchase your seeds from a reliable seedsman, who has his reputation to maintain, and who can be depended upon to send out only seeds of good germinating power, and free from mixtures of any kind other than the variety of which the name appears on each packet.

Some kinds of seeds retain their germinating power unimpaired for several years, cabbage and turnip seeds, for instance, and cucumbers, melons, &c.; while others, such as onions, carrots, and parsnips, are of very little use when more than a year old.

Peas, beans, &c., are also at their best during the first season.

As it would be a difficult matter for the amateur to distinguish in all cases between good seeds and bad, the only plan is to always purchase from a reliable seedsman.

SELECTING VARIETIES.

In making your choice of the kinds of vegetables to grow, do not be misled by glowing descriptions of certain kinds of cabbage or peas, and purchase them under the impression that you have got something wonderful.

It is much safer and more satisfactory to buy varieties which are catalogued as *standard varieties* or *good market sorts*. It is also worth while to find out from your neighbours the names of any varieties which they have grown successfully, and you will thus be enabled to plant something which has already been proved good, and will be likely to have some measure of success with it yourself.

Many beginners in gardening are disheartened at the commencement, by the miserable results of their first attempts, which are in many instances attributable to trying to grow varieties unsuited to the soil or climatic conditions.*

If you have no reliable data to go upon, your seedsman will probably be able to help you in the selection of suitable varieties.

In any case, until sufficient experience has been gained in growing well known and tested kinds of vegetables, it is not advisable to experiment with anything new or rare. The results of such attempts are sometimes far-reaching, inasmuch as a certain kind of crop is frequently condemned as unsuitable for a district, because "So-and-so tried it and proclaimed it a failure." People are very apt to accept statements of this kind without going to the trouble of verifying them for themselves.

I have often been told that a certain kind of vegetable will not grow here, because it has already been tried by someone, when, as a matter of fact, it has proved to be as easy of cultivation as pumpkins or maize, if accorded proper treatment. It is always safe, however, for the beginner to profit by the successes of his neighbours at first. There are many things which only experience can teach, and it is rather expensive to go experimenting with unfamiliar kinds of plants, before learning how to grow the known and established varieties.

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* Seeds may be tested by placing them on damp flannel and noting whether they germinate or not.—Ed. *Q.A.J.*

SOWING THE SEEDS.

Some kinds of vegetable seeds are sown in seed-beds, and when large enough transplanted to the open ground; others are sown directly in their permanent places. For a seed-bed, I know of nothing better than the plan recommended by Mr. Nevill for raising young tobacco plants. A full description and illustration of this form of seed-bed appeared in Vol. II., Part 3 (March, 1898), of this *Journal*, and I can confidently advise its adoption for raising young plants of any kind.

Cabbages, cauliflowers, lettuce, tomatoes, and numerous other kinds are always raised in seed-beds; and it will be found better to sow these all in narrow shallow drills in the bed than to sow broadcast. Young plants grown in drills are much easier to lift and transplant than if broadcasted, and as a rule are stronger and sturdier. In preparing the bed, the soil should be raked as finely as possible, and the seeds must not be sown too deeply. A quarter to a half inch of soil above the seed is usually enough. If the drills are covered in with a little very fine and thoroughly rotten manure, germination takes place quickly, and in transplanting a ball of the manure will stick to the rootlets, thus increasing the chances of success in planting.

In preparing soil for seed-sowing in the open ground, always have the soil thoroughly tilled, cleaned from weeds, and well pulverised. An Acme harrow immediately following the plough will reduce most soil to a very fine tilth; and if not, the rake must be used to finish off, especially with such seeds as carrots, onions, &c.

Where enough ground is available, I should recommend sowing all such crops as these in drills from 2 to 3 feet apart, so that horse cultivators can be used among them.

However, this subject will be more closely gone into when dealing with crops in detail.

TRANSPLANTING.

For transplanting, the ground should be prepared, more especially for delicate plants, in precisely the same way as for seed-sowing. The finer the surface soil is, the more easily will the young tender rootlets be able to force their way down in search of food and sustenance; and as a consequence leaf growth will necessarily follow.

If the soil is hard and lumpy, the attempt of the rootlets to strike into it becomes to some extent useless, and it naturally follows that the top growth also becomes retarded, and it will only be by good luck if the plants come to anything. When taking the plants from the seed-bed, be careful not to break the roots too much, and endeavour to lift them with a little of the soil adhering. Never pull young plants up, but lift them carefully. It is a good plan to give the bed a thorough soaking with water some time before beginning to lift the plants.

Always, if possible, choose a dull or showery day for transplanting; but should the weather be warm and dry, do the work in the afternoons, and water well after planting; and if suitable material is procurable, mulch the ground for a few inches round each plant. Set the plants a little deeper in the ground than they were in the bed, and firm the soil well around the roots without bruising the necks of the plants.

Take care always to make the hole for planting just deep enough, so that the plant will not *hang* in it, and give the plants plenty of room to grow, by setting them a little wider in the rows than the size of the plants when fully grown.

For example, if a cabbage will cover $2\frac{1}{2}$ feet on the outside leaves, set the young plants of that variety out 3 feet apart each way.

Should the weather be dry for some time after planting, it will be necessary to water the young plants several times a week until they become established; the watering being done either early in the morning or late in the afternoon.

Plate LXXIII.

G. C. CLARK'S RESIDENCE, EAST TALGAI.

A great deal of watering and hoeing will, however, be saved if *mulch* is used as already advised. The importance of mulching cannot be over-estimated. Almost anything will do—stable-manure, grass, or litter of any kind, provided it can be easily and conveniently placed around the plants. Mulching prevents the ground from baking after watering, and so saves hoeing; and it also helps to arrest evaporation, thus saving watering; and also it tends to keep the temperature of the surface soil equable, and so tends to promote healthy and vigorous root-action. I confidently recommend mulching for any kind of vegetable crops which require transplanting, and am sure that the grower who tries it once will never give it up again so long as he aims to get the best possible results from his work with as little labour as possible.

SHEEP-BREEDING ON THE DARLING DOWNS.

EAST TALGAI-HENDON.

WHEN the enterprising pioneers of the pastoral industry in Queensland left the mother colony in search of fresh fields and pastures new, they at once directed their steps towards the then newly-discovered Darling Downs. Bringing their flocks and their herds with them, they travelled through New England, then a settled district, and spread over the eastern portion of the Downs from Warwick to Toowoomba, the country farther to the west and at a distance from the Main Range being gradually absorbed, until within a very few years nearly the whole of what is now known as the Darling Downs was taken up and more or less stocked.

The country was then purely pastoral. There was, to begin with, but a scanty population, and it was almost universally supposed that the agricultural capabilities of the district were *nil*.

On the other hand, in spite of initial difficulties and the usual ups and downs of pioneering life, the squatters did well on the whole; fortunes were made and—lost again. When the western portions of the colony began to be taken up, there was a brisk demand for all classes of stock, especially breeding sheep, large lines of flock maiden ewes being sold for stocking the Western runs at £1 per head and upwards. The runs were then all held as squattages. For miles the country lay open without a fence, and for many years sheep were shepherded, the present almost universal system of paddocking being unknown.

All this is now changed. The agricultural capabilities of the district have been gradually discovered and developed. Legislation has prepared the way for close settlement with a rural population, the old squattages have been long ago broken up, and though sheep-raising is still one of the most important, if not the staple, industry of the Darling Downs taken as a whole, yet it is now universally acknowledged that, in a large portion of the district and on freehold land worth from £2 to £6 and more per acre, wool-growing pure and simple will no longer pay.

The pastoralist must give way to the agriculturist, or he must perforce become more or less of an agriculturist himself. He must combine farming with stock-raising, and develop to the fullest extent the capacities of his country. Recognising this fact, many large freeholders have within the past few years rendered the greater portions of their properties available for close settlement either by cutting them up themselves or by selling to the Government under the provisions of "*The Agricultural Lands Purchase Acts of* 1894 *and* 1897." Whether, in time, the pastoralist will altogether give place to the agriculturist with small holdings, time alone will show; but it would seem that even in the most thickly-settled and richest farming districts on the Darling Downs, comparatively large properties are likely to remain in the hands of some of the present proprietors, and that they can be worked by them at a fair

profit. Such properties, consisting of from, say, 5,000 to 20,000 or 30,000 acres, are now and no doubt will more and more continue to be managed on mixed farming lines. In most cases a good deal of cultivation is carried on, sometimes almost entirely in connection with stock-raising, either as feed for stud stock or for fattening purposes. In others, the agricultural operations are of considerable magnitude and are a source of direct profit.

The Darling Downs has been from the start, and still is, the home of the principal stud flocks and of several of the principal stud herds of cattle in Queensland. The district is more adapted for stud-breeding than the purely pastoral country of Western and Central Queensland; the seasons are more reliable; there is less risk of losing valuable stock from periodical droughts; and moreover it is, without doubt, the finest residential district in Queensland. Taking the above into consideration with the fact that there should be, in Western Queensland, a practically unlimited market for rams and bulls, it is very unlikely that the stud-breeders of the Downs will be altogether crowded out by close settlement.

Our illustrations in this number are from photographs taken lately by Mr. F. C. Wills, artist to the Department of Agriculture, at two typical stud sheep properties, East Talgai and Talgai West. These were originally one freehold of about 32,000 acres, but some few years ago, wishing to reduce the size of the property, Mr. Clark sold about 23,000 acres, now known as Talgai West, to the Scottish Australian Investment Company, who also purchased a portion of the stud flock. This property, under the able management of Mr. Aubin Dowling, is carried on as a stud-breeding establishment from which the company supply their large Western properties with rams. No pains or expense are spared to keep the sheep up to a high standard of excellence. The company have kept to the original East Talgai blood, but this year a very high-class son of the noted Tasmanian ram "President" was purchased at the annual sales in Sydney for 510 guineas.

Besides the stud sheep, Mr. Dowling has lately started a dairy herd with imported stock from the Illawarra district, in New South Wales. There is a small creamery at the head station, with cowyards, piggeries, &c., put up in the most approved style; and at a short distance from the homestead is a dairy farm, with cottage and all improvements necessary for working same, which has been taken by a tenant on the share system. It is proposed to let several other dairy farms in this way.

Several hundred acres have also been let to tenants as wheat farmers on shares, and, besides the cultivation required for the stud sheep and dairy cattle, Mr. Dowling has tried a little cultivation for profit.

East Talgai, the residence of Mr. George C. Clark, and formerly of his father, Mr. George Clark, being only a small but choice property of 9,000 acres, is worked almost entirely as a stud farm, everything else being subservient to the stud sheep. About 700 head of cattle are kept, mostly fattening steers, for the purpose of eating off the rough grass, and the country is kept considerably understocked with sheep. It is subdivided into numerous paddocks, watered principally by wells and windmills, as, although Dalrymple Creek runs right through the property, the losses of valuable stock from bogging caused so much annoyance that it was considered better to water the stock in this way, and fence off the creek. About 500 acres of land are kept under cultivation, part laid down in lucerne, and part sown annually with Cape barley; other crops, such as pumpkins and mangolds, are also grown for the stud sheep, and a good supply of hay is always kept in reserve.

Most of the flock rams bred at East Talgai are taken for Western Queensland stations, and, besides the annual draft of flock rams, Mr. Clark sends small lots of high-class sheep for sale to the Sydney Ram Fair, and to the annual shows now held at Longreach and Hughenden. Being also an exhibitor at the above-mentioned places and at the shows at Toowoomba and Brisbane, a certain number of the choicest sheep intended for show and sale are always hand-fed during about six months of the year.

Plate LXXIV.

STUD RAMS, EAST TALGAI.

Plate LXXV.

STUD SHEEP, EAST TALGAI.

Our illustrations show one of the sheds in small paddocks round the homestead devoted to this purpose. The sheep, when being fed, are for some time before show (unless for exhibition in unhoused classes) shedded at night and in wet weather.

Except for the above sheep and a few of the most valuable stud sires and young rams, which are kept in small paddocks round the head station, little or no hand-feeding is resorted to in ordinary seasons, but in droughts or exceptionally severe winters a good many of the sheep are fed on hay, chaff, &c. Molasses has been used with chaff, with good results ; ensilage has also been tried, but, though eaten readily by the sheep, the results were disappointing.

A good deal of Cape barley is grown every year both at East Talgai and Talgai West, and at many other places on the Downs. The method usually adopted is to treat it as pasture. Sow thickly in March or April, turn the sheep in when it begins to stool out and is not more than a few inches high, and keep it well eaten down. A good barley paddock will, when thus treated, carry up to ten or twelve sheep or more to the acre the season through, and double that number can sometimes be carried for a month or two. If autumn rains give the crop a good start, it is surprising how well it will stand, even in very dry frosty weather. If the sheep are taken off any time before about the end of September, when as a rule spring has commenced and the feed is no longer required, a good crop can usually be obtained—in fact, Mr. Clark has harvested up to ten and twelve bags to the acre from Cape barley that had been heavily stocked all the winter. The grain supplies seed for the following year, excellent horse and sheep feed when crushed or boiled, and the surplus can be sold to pay expenses of working the land.

Prairie grass is also extensively grown by some of the Downs sheep-breeders, but is rather a precarious crop, requiring rain at just the right time and apt to fail when most wanted. The usual time for shearing on stud places, at any rate as far as the stud sheep are concerned, is earlier than on most other Darling Downs stations. East Talgai shears in September, Talgai West follows immediately. Sheep intended for sale at Longreach, Hughenden, and Sydney are shorn still earlier.

The principal lambing takes place from September to November, but at East Talgai studs are also lambed in April and May, and indeed all through the winter, and for these autumn and winter lambs cultivated paddocks are in most seasons a necessity. The lambs from the first stud ewes are all carefully numbered and registered in the stud-book, and all the breeding ewes are carefully classed every year—in fact, the most important part of the work in connection with a stud flock is the judicious mating of the ewes with the different sires.

It is not within the scope of this article to enter into details as to the breeding, &c., of any of the flocks on the Downs. A descriptive history of the different studs would require more space than is here available ; but the few notes given as to the system of management pursued at East Talgai and Talgai West would be applicable in a great degree to most of the other stud properties.

SILOS AND SILAGE.

One cubic foot of silage weighs about 45 lb.

Every 50 cubic feet of the volume of a silo will hold 1 ton.

A cubic foot of silage per day is sufficient ration for cattle which have the run of grazing paddocks.

For stalled cattle 60 lb. are needed, in addition to some hay or other feed.

Well-packed silage will shrink to five-sixths of its bulk when first put into the silo.

About 5 per cent. of the silage in the silo is waste.

The weight of silage is slightly less than that of the green fodder it is made of.

Mr. Walter Madden (Victoria) says:—"The same 50 acres of green stuff that would produce 100 tons of hay at a cost of about £1 per ton for making, would produce 300 tons of silage at 2s. per ton for the making. The 300 tons of silage when made would be worth at least double the amount per ton that the hay would be worth."

Ten tons of green fodder equal 3 tons of hay, and 10 tons of green fodder will make almost 10 tons of silage.

The hay would feed a beast for 120 days, and the silage for 400 days, and, in addition, the silage-fed beast will milk better than the hay-fed one.

The milk produced by silage is richer in cream, the butter is sweeter and of a better colour, and the cost of feeding is about one-half as compared with bran and chaff.

Maize and barley make the best silage.

Green fodder should be put through a silage-cutter. This saves heavy weighting.

The silo should be filled at intervals, allowing the first layer of 3 or 4 feet to heat up to 125 degrees before adding more.

The silage should be well tramped down and packed tight in the corners.

Silage should be fed from the top.

Stack silage need not be weighted.

Silage should undergo thorough fermentation to turn out good.

A stack of 50 tons will take about six weeks to reach a maximum temperature of 160 degrees Fahr. It will then gradually go down until in about four months the normal temperature is reached.

A building 20 feet long, 12 feet broad, and 10 feet high to the eaves, with an additional height of 6 feet from the eaves to the ridge, will contain 2,880 cubic feet. As each 50 cubic feet of silage weighs a ton, this gives 57 tons 12 cwt. as the capacity of the silo.

TO FIND THE CONTENT OF A ROUND STACK.

WHERE very great accuracy is not required, the content is sometimes found by taking the height of the stack from the ground to the eaves, and adding to this the third of the height from the eaves to the crown—the sum of these by the mean girth gives the cubic content.

The content thus found is less than the truth, but the loss is not great, seeing that the stack is not so dense at the top as at the bottom.

TO FIND THE MEAN GIRTH WHEN THE STACK TAPERS REGULARLY TO THE EAVES.

Add together the girth taken at the bottom of the stack and the girth taken at the eaves, both in feet; then half the sum is the mean girth. When the stack does not taper regularly, girths must be taken in several places and added together, and their sum divided by the number of girths taken; the quotient is the mean girth. Then with the mean girth found in one of these ways and the height of the stack from the ground to the eaves, find the content of this portion of the stack.

Next find the content of the top portion or roof by taking the girth at the eaves multiplied by the perpendicular height from the eaves to the crown of the stack, the third part of which is to be added to the content of the body portion already found, and their sum shows the content of the stack in solid yards and feet.

EXAMPLE.

Required the solid content of a circular stack, the girth at the bottom being 56 feet, the girth at the eaves 63 feet, the perpendicular height from the ground to the eaves 12 feet, and the perpendicular height from the eaves to the crown of the stack 9 feet.

CONTENT OF THE LOWER PORTION OF THE STACK.

Add together the two girths, 56 and 63 = 119, half of which is $59\frac{1}{2}$ feet—the mean girth.

Square this mean girth, and we have—

$59{\cdot}5 \times 59{\cdot}5 = 3{,}540{\cdot}25$, which is the area of the base.

Now multiply this area by 10, and divide by 125 (or multiply by ·08, or roughly by $\frac{1}{12}$)—

$3{,}540{\cdot}25 \times 10 = 35{,}402{\cdot}5 \qquad 35{,}402{\cdot}5 \div 125 = 283{\cdot}2$.

Multiply this by the height of the stack (12 feet)—

$283{\cdot}2 \times 12 = 3{,}398{\cdot}4$ cubic feet;

which, reduced to cubic yards (27 cubic feet = 1 cubic yard), gives us 125 cubic yards as the solid content of the lower portion of the stack.

We now have to calculate

THE CONTENT OF THE ROOF.

Square the girth at the eaves (63 feet)—

$63 \times 63 = 3{,}969$.

Multiply by 10—

$3{,}969 \times 10 = 39{,}690$.

Divide by 125—

$39{,}690 \div 125 = 317{\cdot}52$.

Multiply by $\frac{1}{3}$ of the perpendicular height of the roof (9 feet) : $\frac{1}{3}$ of 9=3. Then, $317{\cdot}52 \times 3 = 35{\cdot}28$ cubic yards.

Thus the whole stack is shown to contain—

In the lower portion	125 cubic yards
„ upper „	$35\frac{1}{4}$ about
	$160\frac{1}{4}$ cubic yards.

TO CALCULATE THE CONTENT OF AN OBLONG STACK.

Suppose our stack to have the following dimensions:—Length, 50 feet; breadth at the eaves, 17 feet; at the bottom, 12 feet; perpendicular height from the ground to the eaves, 13 feet; and from the eaves to the ridge of the stack, 7 feet. The following calculation will give the content in cubic feet:—

Get the mean breadth by adding together the breadth at the eaves and the breadth at the base, and divide by 2. That is—

$\frac{17 + 12}{2} = \frac{29}{2} = 14{\cdot}5$, the mean breadth.

Multiply by the vertical height (13 feet):—

$14{\cdot}5 \times 13 = 188{\cdot}5$ square feet, area of lower portion.

For the roof, multiply the breadth at base of eaves by half the perpendicular height from eaves to ridge.

$17 \times 3{\cdot}5 = 59{\cdot}5$ square feet, area of roof.

Add the two areas together, and multiply by the length of the stack, and we get the cubic content as follows:—

$188{\cdot}5 + 59{\cdot}5 = 248 \times 50 = 12{,}400$ cubic feet,

or nearly 460 cubic yards. The hay in such a stack would weigh perhaps 150 lb. per cubic yard (but this is a very variable quantity); hence the total weight of hay would be about $24\frac{1}{2}$ to 25 tons. If it is a wheat stack, we may take a cubic yard to represent one bushel of grain. The stack should thresh out 460 bushels. But these weights are merely approximate, as both hay and grain vary largely in weight.

TO CALCULATE THE WEIGHT OF HAY IN THE STACK.

Hay necessarily varies in weight, according to quality, size of stack, age, &c.

New hay may weigh 8 or 10 stones per cubic yard (112 or 140 lb.). When the stacks are ten or twelve months old, the cubic yard may weigh 14, 16, 18, and as much as 20 stones.

Taking 140 lb. as the weight of a cubic yard, such a stack as we have described would contain 22,400 lb. or 10 tons.

THE QUANTITY OF GRAIN IN THE STACK

may be estimated at the average quantity of 1 bushel to the solid yard (Baildon); but, if the crop has been mown, a yard will not average more than 3 pecks.

STACKS OF STRAW

may be estimated at the rate of 18 to 20 yards to a ton.

CONTENT OF SILOS.

A QUESTION was put to us the other day which involves more intricate calculation. A farmer has a quantity of sorghum which he wishes to put into a silo, and wishes to know what sized building he would require. We find that his crop will take up a volume of 25,000 cubic feet.

We know that a building 20 feet long, 12 feet broad, 10 feet high to the eaves, with an additional height of 6 feet from eaves to ridge will contain 2,880 cubic feet. Now, without going into the calculation here, which involves the extraction of the cube root, we find that, by doubling all the dimensions above given, the building will hold 24,960 cubic feet of silage.

Bush Work.

By A. J. BOYD.

WITH the advent of fencing-wire and wire-netting, the occupation of the splitter and fencer is no longer of the importance it possessed in the early days. Galvanised iron also has almost done away with the shingle-splitter, and wire-netting takes the place of palings. Still, whilst timber remains, and scrub farms are yet the home of the fecund wallaby, the farmer, not overburdened with cash, finds that a knowledge of splitting comes in very handy, and saves him from much immediate outlay. He requires slabs for his first dwelling, and shingles to roof it with, unless he can obtain a good supply of stringy or box bark. Palings are an absolute necessity on farms cut out of the heart of our dense scrubs to keep out the destructive marsupials. Where good splitting timber is available, it is foolish waste to burn it off and then pay down solid cash for wire-netting and galvanised iron. Stockyards and pigyards also will use up a large quantity of post and rails, all of which have to be got out of the timber covering the farm.

Now, whilst many young men destined for a farming life can plough, sow, and do all that is required with horse implements and labour-saving appliances, there are few who have not been bred up on and who have not assisted in clearing and fencing farms in timbered country who would know how to set about the work of getting fencing stuff. They probably have not the slightest idea of choosing a tree that will "run" well. As a consequence they must either make sapling fences or they must call in the aid of a professional fencer, and pay him for doing work which, in their leisure time and in rainy weather, they could easily do for themselves at no actual outlay of cash beyond the necessary tools.

Splitting, then, should, I maintain, form a part of an agricultural education, as much as ploughing. Indeed, for the scrub farmer, ploughing is not nearly so necessary as splitting and clearing timber, because quite two years, if not three, must elapse before he can begin to stump his land to fit it for the plough, all the work being done meanwhile with axe and hoe.

Again, take the use of the American axe. It is an art, and one which can only be gained by experience and much practice. Look at a new chum cutting down a tree. He chops away all round it until he has produced a sort of ragged peg-top, and then discovers that he cannot get another chip out anywhere; yet there are 6 or 8 inches of wood to get through before the tree can fall, so he pounds away fruitlessly, jamming the edge of his axe in the bottom of the cut, probably springing the handle. Then, when his tree decides to fall, there is no telling which way it will go, and he probably runs away, and usually the tree falls in his direction, and he runs the risk of being killed or of killing others who may be admiring his skill.

Not many of our town-bred lads have ever learned to handle an axe, nor can they ever do so without proper instruction.

Sawing off a log appears an easy piece of work, but one unused to it will give himself and his mate an amount of hard work which could easily be avoided. In this connection we have to learn the setting, sharpening, and "gumming" of a saw—all requiring skilled teaching. Even the grinding of an axe to enable it to do the best work is an art.

I propose to give a few lessons in the art of timber-getting, splitting, and fencing—lessons which I have learned myself practically for the purpose of gaining a living; and although practical lessons in the bush are worth reams of paper teaching, still something may be gained, I hope, from what follows here.

THE TOOLS.

I shall first deal with the tools required for all splitting and fencing work. These are:—The American axe, crosscut saw, maul rings, set of wedges, running-out axe, shingle throw, tomahawk or shingling hammer, morticing axe, auger, adze, crowbar, pick, long-handled shovel, grindstone, three-cornered files, saw-set, spokeshave, handsaw, oilstone, wooden maul, shingling mallet, and rammer. The three latter, of course, are made of bush timber. It is not good policy to restrict oneself to a single tool of each kind. Accidents will happen, and possibly the splitting camp may be located many miles from a store where anything can be replaced. By the way, a piece of greenhide will be found very serviceable in the bush, and also a few pieces of old boot uppers—the latter being very handy for tightening a handle in the eye of a throw or running-out axe.

We will suppose that the full equipment is obtained, and the splitters to have reached their destination either by boat, dray, or packhorses.

If no tent has been provided, obviously the first thing to do—after lighting a fire, and making sure of plenty of water—is to rig up a shelter of some kind. Where bark is plentiful, this is a matter very soon arranged. But yet, here, at the very outset, the new chum is confronted with his first difficulty—how to take off a sheet of bark 6 or 7 feet long, without a ladder. Then his experienced mate will teach him to make a bush ladder with a forked sapling.

HOW TO TAKE OFF A SHEET OF BARK.

If the sap is well up, this is an easy process. First cut the bark through to the sapwood at a height of 2 or 3 feet from the ground. Next prop your forked sapling against the tree, and, standing on the forks, cut round the tree at whatever height you wish your sheet of bark to be. Then make a perpendicular cut, connecting the upper and lower cuts. Be sure that the bark is cut quite through, or in taking it off it will be almost sure to split when you reach the unsevered part. Now take a sapling about the size of a hoe handle, and cut one end to a wedge-shape, but only flatten one side.

If both sides are flattened, there is danger of the pole piercing the bark and splitting it. The edge of the perpendicular cut may now be opened flaplike with the axe. Then detach the bark by inserting the pole between the bark and the wood, moving it regularly from top to bottom. If the sap is well up, the bark will come off clean. It will be necessary for one man to stand by to prevent the detached sheet from falling on its back on the ground, in which case it will usually split in half. If alone, put a widely forked prop behind it and work very gently at the last. The sheet will then slip off and lean against the tree. Should the bark stick at any point, a gentle pounding on the outside with the back of an axe will cause it to become detached. Now you have your sheet of bark, but it is a stiff cylinder, and any attempt to flatten it out will result in its destruction by cracking in several places. To avoid this (if stringy bark), tear off a quantity of the rough outer bark, lean the sheet against the tree, green side in, and set fire to the rough fibrous bark piled inside it. Keep the fire going as long as small reports are heard. This process steams the bark, after which it may be laid on its back, and it will generally open out flat as a pancake. It is a good plan to shave off all the rough outside fibre with a shovel, because the soft covering retains moisture in wet weather. Pile several sheets one on the other, and load the heap with logs. They will thus retain their flat shape, and become as stiff as boards. Two good men can easily take off forty sheets a day. With box bark, the burning is not so necessary; still a good steaming does no harm.

In the early days of Gympie Gold Field, I have taken off sheets of ironbark, but this is laborious work, owing to the thick rough outer bark which has to be chopped off before attempting to remove the sheet, and even then the result is not satisfactory, as this bark readily splits in removal.

Where there is plenty of ti-tree, or paper bark, the process of humpy-roofing is much simpler. The thin paper-like bark laid over the sapling rafters and battens forms a covering perfectly impervious to rain. I once lived through a rainy season for six months under such a roof, and no rain ever got through it.

The bark being ready, a few rough posts and saplings form the framework, and now the greenhide cut into strips has to do its duty. Through holes bored in the bark, a strip of hide is passed, a wooden toggle being inserted on the outside, and the ends of the hide tied firmly round the sapling battens. The sides of the hut are formed in the same manner, and a couple of sheets form the ridge-capping. To keep the roof in position, three heavy saplings are laid longitudinally on each side, and held together by doglegs pinned on to them with wooden treenails. Such a hut can be built in a day. With the interior arrangements this paper need not deal.

PREPARING THE TOOLS.

The first thing to do is to set up the grindstone; the next, to sharpen and set the saw. Both the style of sharpening and setting depend upon the nature of the timber to be worked. For hardwood a needle point is required, and a flat setting sufficient to allow the saw to run easily without jamming. For pine, a broad tooth and wider setting are needed. The handles of the saw should be about eight to ten inches long wedged into the eyes. The running-out axe requires a stout handle some 4 feet long to afford good leverage power.

The maul should be cut from a sound, cross-grained, dry ironbark limb. The ends are dressed to allow of the rings being driven on. About a quarter of an inch of the wood should protrude beyond the rings. Wooden wedges are then driven into the wood, which is thus forced against the rings, holding them firmly in place. The projecting wood soon flattens down over the rings, and prevents their being battered by contact with the iron wedges. A hole is next bored into the maul, a smooth handle is inserted, and all is ready for felling and cutting up the tree.

SELECTING A TREE.

This is a most important matter, and one which requires great judgment and experience. Some old splitters can tell at a glance whether a tree will "run" freely or not. Others examine the bark of an ironbark or stringybark, and from its corrugations will judge of the toughness or otherwise of the timber. If the perpendicular corrugations run in parallel lines, the tree will in all probability be easy to "burst." If on the other hand the lines are interlocked, the timber will probably be the same, and take great labour to open; or, if winding, the resulting rails will probably be useless, although posts got from such a tree might be used. As a rule, a tree hard to "burst" will "run" more evenly than one which bursts freely. A good way to tell a tree is to cut out a large chip, and split it. If it splits freely, it is probable, but not always certain, that the whole tree will split well. It sometimes happens that the chip is hard to split, or is very stringy, yet the upper portion of the tree splits freely, so that after all the chip is no certain guide.

An experienced splitter can generally tell if a tree is hollow, by noticing that some of the broken limbs are hollow, and that sometimes branches shoot out from the main stem almost from top to bottom. Such a tree is pretty sure to have a pipe, which makes it all the easier to split. A tree plentifully besprinkled with large round knots should not be rejected on that account, for the knots are rarely found to extend beyond the sap wood. In getting timber for sawmills, some use an auger, and bore into the tree to find out if it has a pipe, in which case it is rejected. But where the log timber-getter is also a splitter, the pipy log, if felled, comes in for posts, rails, shingles, palings, or spokes. Illustrations of these trees will be given in next month's *Journal.*

We will now suppose the tree to be selected. It should be a good-sized one with a straight barrel, from 2 to 4 feet in diameter or larger if possible, with at least four good cuts of 9 feet in length, for the larger the girth and the longer the tree the less the labour.

The next question is

TO FELL THE TREE.

Felling a tree scientifically is an art gained by long practice. We are dealing now with saw work. The first thing to be done is to ring the tree, removing a ring of bark about 6 inches wide all round, exposing the sap wood. The saw is then entered on the leaning side. If the tree be absolutely perpendicular, a survey of the branches above will clearly indicate to which side the tree will incline when falling. It will naturally fall on the side of the heaviest limbs. In such a case the cut is begun on that side. To ensure a perfectly horizontal cut, the saw must be held horizontally, care being taken to keep the back up, as it tends to sag downwards, until it has entered far enough to rest on the lower side of the cut. But still the back must be kept up, for, if cutting proceeds with the back resting, the cut will naturally take an upward direction.

Having entered the saw to a depth not further than nor even quite so far as the centre of the tree, withdraw the saw. Here I may remark that when a tree has a considerable lean, the saw should be withdrawn as soon as it is in the least pinched by the coming together of the two parts of the cut. Cases have occurred in which the saw has moved fairly freely, and yet could not be withdrawn owing to the cut having closed behind it. In such a case nothing

remains to be done but to chop the saw out, unless it has a removable eye, and then of course it can be withdrawn through the cut, so long as it has motion at all. Having now entered the saw as deeply as the hang of the tree will allow, or, in the case of a perpendicular tree, almost to the centre (although to one-third of the diameter is preferable), the sawyers go to the opposite side of the tree and again enter the saw. Now it is that great care and nicety are required. If the new cut is begun too low, either there will be great labour in wedging the tree off at the last, or it may fall towards the lower cut, and loss of life may ensue. If the cut be too high, over half the first log will be some inches longer than the remainder, and as a consequence the rails, posts, or whatever is to be split from it will be of unequal length and form a "job lot," entailing extra work on the fencer.

I have known men to hit the first (or belly cut) so exactly with the back cut, that, except for the unavoidable splintering of the last fibres of wood holding the tree up, none could have told that the two were not a single cut. I had a mate who always drew a charcoal line round the butt of the tree, and worked to that line so truly that we rarely had a difference in the stuff split from the butt log.

Now come some of the niceties of felling, which are adopted to ensure the safety of the timber-getter and also the soundness of the log. Many a tree has split up before being two-thirds cut through, by badly managing the final cutting, especially in a high wind. But I would not advise anyone to attempt to fell heavy timber during a gale of wind. I have tried it on two or three occasions, and always with loss.

The usual result is what is technically known as a "kick up."

This is caused in the following manner:—The tree is a slightly leaning one; a heavy breeze is blowing; a deep belly cut has been put in. The back cut has got well in, and the tree is a free running one. Each pull of the saw weakens the remaining wood. Suddenly a gust of wind seizes the top of the tree, which leans over and splits from the depth of the back cut to a length of perhaps 15 feet. Then one of two things happens. Either the back half of the tree, breaking off from the lower half, makes a wild flight into the air and comes down suddenly with terrific force, some distance to the right or left of the stump, or else it does not break right away, but remains suspended. In either case the tree is useless to the splitter. I shall presently show the great danger which exists in this and other cases to human life. Meanwhile I will proceed to fell the tree which has been waiting for us. Having got the saw in to a little over its own depth (in a tree 3 feet in diameter, say) in the back cut, if you hear no cracking sound you may go on sawing till you reach a depth of 15 or 16 inches. Now, without withdrawing the saw, move round to one side gradually, continuing to cut as you go. This is cutting out the "quarters." You do this on both sides till your quarter cuts join the belly cut. The quarters must be deeply cut in, as it is this work which prevents the tree, if a free one, from kicking up and splitting. Now you go back to the back cut, and as there is now plenty of room behind the saw you insert one or more wedges.

Although the time to decide where a tree shall fall is before commencing to cut (the belly cut always being put in on the falling side), yet the needful direction can be given by the judicious use of wedges. Another great help is to cut a notch out of the stump, leaving the butt projecting about 3 inches.

This notch serves a double purpose. It leads the tree in the direction in which it is to fall, and it quite prevents the tree from slipping back on the stump (as often occurs), and rushing backwards over it for many feet like a battering-ram. I have known men killed by a tree doing this, and I saw a most miraculous escape of a mate of mine when we were felling an enormous ironbark at the Pimpama, at Ormeau. This tree was nearly 6 feet in diameter, and rose perfectly perpendicular to a height of about 50 feet to the first branch. We cut this tree completely through, so that it actually spun on the wedges, which would take no effect on it. We, of course, stood at the

stump waiting till it should begin to fall, when we would step back quietly. Suddenly the tree, probably acted upon by a light puff of air up aloft, turned slightly and began to fall in the direction in which we were standing. It then slipped over the stump. My mate, instead of standing his ground coolly, became panic-stricken, and ran right in the track the huge tree was shooting along, supported on the stump. Just as the butt reached him he fell, and I saw that enormous tree rear up twenty feet in the air and come down with a crash within a foot or so of the fallen man. At Indooroopilly a man was jammed three feet into the earth by a big tree acting in like manner. It not only killed, but actually dug his grave and buried him.

However, we shall never get our tree down at this rate. We have made the belly cut, the back and quarter cuts; we have notched our stump, and now you may put your wedges in. If you wish the tree to fall towards the right a little, hammer up your left-hand wedge with the maul, and keep on pounding until the maul rebounds with a dull thud. That is a sign that the wedge will go no further till the wood is further cut. Now go to work with the saw again. Cut well in at the quarters; then cut out the back wood. Keep hammering up your wedges. Now when you hear the tree begin to crack, you must keep your nerve and stick to the saw. Saw as hard and as quickly as you can, so as to cut the last inch, if possible, before the final separation takes place. As the tree gracefully bows its head for the crash, *on no account run away*. Stand fast, even with your hand on the falling giant, till you are quite sure that it is going clear on to the spot you decided on. *Then* step well clear, for a tree on striking the ground often rears up its butt like a dying whale its tail, and brings it down with a flop, perhaps 6 feet to either side, but you have, meanwhile, quickly got 6 feet away from danger. Running away is the most dangerous thing a man can do when felling a tree with the saw. When felling with an axe there is no need to run, for the tree in falling jumps forward clear of the stump and never "goes back on you."

When timber-getting in a scrub, the timber-getter runs the gauntlet of several dangers. First, the head of the chosen tree is often out of sight. Next, it is usually bound to hundreds of other trees by stout lianas or vines; vegetable ropes that hold it up, even when cut through, and cause it to defy any attempts at directing its fall. Then the sawyer is surrounded and hampered by thick-growing brushwood and young saplings, interspersed with "lawyer" and other troublesome vines. Perhaps, at the foot of the tree, where the foot would rest in working the saw, there is a large jumper ants' nest, and not unfrequently a fine snake comes crawling along to see how matters stand. So that the sawyer has to look into the air, on to the ground, and watch his work at the same time. The first thing to do here is, of course, to provide an avenue of escape, by clearing away vines and undergrowth, if not all round, at least to the width of a clear track.

Should a gust of wind suddenly force the tree towards the back cut, the saw will inevitably be jammed. If the tree refuses to answer to wedges and gets a decidedly wrong lean, it is useless to try and release the saw. Wrenching at it will only result in "buckling" it. Besides, in such a case, the tree is liable to fall at any moment, and in any direction except the right one. The best thing to do is to let go the saw and await developments. The tree *may* go back if the breeze dies away. When this happens, ram in your wedges as quickly as possible, and go on sawing.

I once saw a marvellous escape from death, resulting from such an accident as I have described. My mate and I were timber-getting above the Seventeen-mile Rocks, on the Brisbane River, in 1863. We got the saw jammed by a gust of wind. He stuck to the saw whilst the tree was groaning and cracking. I called to him to let go. Instead of doing so, he actually got in front of the tree, and caught the saw on both sides protruding from the cut, to try and work it out. Suddenly the tree fell. He just had time to throw himself at full length alongside a dead log. I saw the big tree crashing down across this log, which looked old and rotten. If it were crushed, then I would

have to pick up what was left of my mate and hold a private inquest. He sang out: "Good-bye, lad; I'm done." But he was anything but done. The log was solid. His first move on crawling out was towards his beloved saw. "There! I knew it would be buckled." Not a word about his wonderful escape, which seemed to him but an ordinary circumstance.

Now, one word about working the saw. Some inexperienced men, in fact all, think that by laying their weight into it they are doing good work. This is their mistake. The saw should run easily, no violent pressure being placed on it. Especially in felling a tree is it essential that each man should give to the other. If one man keeps digging the saw in, he drags the other after him. I have sometimes allowed a new chum to pull me round from the back to the belly cut, and he has wondered how it happened. It is the same when cross-cutting. The saw should run easily, working by its own weight. No undue pressure is required.

It is not a bad idea, when felling a tree, to lay a couple of small logs at about 10 feet apart, and let the tree fall on them. This raises the butt from the ground and admits of easy cross-cutting without any more wedging than is necessary to keep the cut open to allow of the free running of the saw.

Having now felled our tree, we are ready to work it up, and, in my next, I shall give directions for cross-cutting, and bursting the logs.

Dairying.

MAIZE FOR DAIRY STOCK.

In the course of a discussion upon fodder plants at the October meeting of the Meadows Branch of the S.A. Bureau of Agriculture, Mr. Pearson stated that he had tried many fodder plants, but found the best to be lucerne, sorghum varieties, and mangolds; ensilage also was valuable. Mr. Grigg did not favour maize, and thought prairie grass and lucerne best. Most of the members favoured lucerne and ensilage, as they thought maize produced fat and not much milk. On this subject Mr. John Mahon, Principal of the Queensland Agricultural College, where last month the dairy cattle were being fed exclusively on maize fodder, says that whilst lucerne is not to be despised as a fodder, he finds that barley and maize are excellent for producing milk. Maize is certainly not putting fat on to the College dairy cattle, but it has undoubtedly increased the milk yield. As the quantity of milk given by each cow daily is always registered, the results of feeding on barley, lucerne, maize, bran, and molasses are of course quite reliable, and, as stated, Mr. Mahon is decidedly in favour of maize fodder as a milk-producer.

PLAIN TALKS ON BACTERIA AS APPLIED TO FARM PROBLEMS.

Continuing a series of clear and practical papers on bacteria as applied to Farm Problems, Professor H. S. Russell, Professor of Bacteriology at the Wisconsin (U.S.A.) College of Agriculture, discourses as follows:—

HOW CAN BACTERIA BE EXCLUDED FROM MILK.

Long before he was told the reason, the practical dairyman learned by experience that cleanliness, thoroughly carried out, enabled him to secure his milk in a satisfactory way. The desired result can, however, be much easier accomplished if we know the sources of bacterial infection. Washing the

udder to prevent dislodgment of dust particles, steaming the pails and cans to destroy lurking germ life, rejecting the fore milk, keeping the stable free from dust during the milking, are all practical methods that have a rational scientific basis.

Where these methods are conscientiously carried out, good results are to be obtained with ease. Private dairies, that are engaged in supplying the best quality of milk, are following such methods with success. For factory purposes, such scrupulous care as is practised in milk dairies would perhaps be considered impractical ; but if our factory milk was handled with equally great care, the hundreds of thousands of dollars that are annually lost in this State alone on inferior dairy products would, for the most part, be saved.

EFFECT OF CHILLING ON BACTERIAL GROWTH IN MILK.

Suppose that the greatest care has been taken to secure the milk in as clean a manner as possible. This will reduce the number of bacteria in the same proportion, and yet, if no pains are taken to chill it, the advantage gained will be largely lost. The temperature of the milk as it comes from the cow approximates blood heat, and, therefore, the conditions are most favourable for bacterial growth. At 80 degrees Fahr. a single organism will form 120 new individuals in four hours, while the development of the same germ would have been so retarded at 50 degrees or 55 degrees Fahr. that but little increase would have taken place.

The secret, then, lies in early cooling. If the milk is allowed to cool naturally it loses its animal heat so slowly, especially in a large volume, like a canful, that the bacteria that are contained in it are able to multiply in a vigorous manner. To check this development, the milk should be cooled as soon as possible. An early diminution of the temperature is much more efficient in checking growth of germ life than even a longer exposure applied later.

WHY MILK SOURS.

If milk is allowed to stand for several days, it almost invariably undergoes a change that is known as souring. Its physical appearance is much altered, and the once valuable food is converted into a relatively worthless by-product. This change is a fermentative process that goes on in the milk, and is caused by a large group of different bacteria. These kinds are particularly numerous in stables and barns; moreover, they seem to find in milk such good surroundings that they grow with great rapidity.

The sour taste of milk, so fermented, is due to the formation of lactic acid, that is produced by the splitting up of the milk sugar in the milk. As acid is formed in gradually increasing amounts the chemical reaction changes from a neutral to an acid condition. When the amount of acid formed approximates 0·6 per cent., the casein is unable to remain in its normal condition, and is precipitated, forming the solid curd that is characteristic of a sour-milk fermentation. The formation of acid does not go on until the sugar of the milk is all decomposed, for the lactic-acid bacteria are unable to grow where the amount of acid exceeds 0·8 per cent. They are retarded, therefore, by the presence of their own by-products.

The souring of milk is so universal a phenomenon that it is considered almost a natural and inevitable change in milk, and yet, if milk could be secured without bacteria, it would undergo no such change.

DOES THUNDER SOUR MILK?

No exception can be taken to the statement that milk is very apt to sour during a thunderstorm. This universal experience has led to the notion, thoroughly believed by many, that the cause of the souring is due to the action of thunder, or possibly the electric discharge. Experimental researches upon this question, however, fail to establish any such relationship. The passage of the electric spark through milk does not increase the acidity of the same. If bacterial growth is held in check in various ways, no atmospheric disturbance,

as thunder or lightning, has any effect. All the evidence indicates that the increased tendency toward the formation of lactic acid is due to the more favourable growth conditions that obtain at such a time. The warm, muggy atmosphere favours rapid germ development, and consequently the souring changes occur more quickly.

MIXING NIGHT AND MORNING'S MILK.

A well-established rule of dairy practice is not to mix the night and morning's milk, or, to put it on a broader basis, fresh and old milk. Common experiences teaches that this mixture is apt to sour much more rapidly than where the two milks are left separate. The reason for this is a physical one, and is based on the difference in temperature of the two lots, and the relation that these temperatures bear to the bacterial life that is contained in each milk. Under normal conditions the older the milk is the richer it is in germ life. but the night's milk is usually cooler than the morning's milk, which is relatively deficient in germ life. The mixture of the two lots raises the temperature of the whole mass, and at the same time increases the germ content of the fresh milk so that fermentative changes occur more rapidly.

If night's milk at a temperature of 55 degrees Fahr. contains 1,000,000 bacteria per cc., and the morning's milk, at a temperature of 80 degrees Fahr., has only 20,000 organisms per cc., the mixture of the two in equal volumes would raise the temperature to about 65 degrees. At this temperature the 510,000 bacteria in the mixed milk would grow more rapidly than the 1,000,000 at a lower temperature, and would, therefore, sour the same sooner.

HOW CAN WE DETECT BACTERIAL FROM OTHER TAINTS?

Before one can intelligently search for the cause of the taint in milk, he must have some idea as to the character of the same. A tainted condition arising from any source injures the quality of the product, but the effect of a taint is largely determined by its character.

Taints may be classified into two groups depending upon their origin—

1. Those produced by bacterial fermentations in the milk;
2. Those caused by the absorption of odours directly from the animal, or after the milk is drawn.

In the minds of most dairymen, the latter class has been considered the more important, and the effect of the first group has not been adequately recognised. As a matter of fact, a larger number of taints, that affect the quality of milk, are induced by bacterial growth than otherwise. The danger that comes from this class is, that it is caused by a living organism, and, therefore, may be widely distributed unawares. A physical taint is unable to reproduce itself, so that a mixture of tainted milk with a larger quantity of normal milk serves to diminish the intensity of the taint.

The manner in which the respective taints are produced enables one to detect the difference. If produced by germ origin, a well-marked taint in any milk can be propagated from one batch of milk to another, by transferring a small quantity and placing it under conditions that favour bacterial growth. Particularly is this true, if the inoculated milk is first heated to destroy pre-existing bacteria. If it has been directly absorbed from some external source, it cannot be transferred in this way.

Then, again, if a taint is produced by biological causes, it will not, ordinarily, appear until some time after the milk is drawn; for, as a rule, bacteria gain access to the milk subsequent to its withdrawal, and a certain period of incubation must elapse before the taint-producing organism can increase in sufficient numbers to produce the obnoxious odour or flavour. If the defective condition of the milk is due to direct absorption from the animal, as is the case where the food contains volatile odour-producing substances, then it will be noted immediately after milking. Aeration of the milk is often recommended in such cases, but sometimes the odour is so persistent that this fails to eliminate it.

Milk may acquire a taint some time after milking, and still it may be due to direct absorption. If it should happen to be placed in a room with odour-yielding substances, it can easily acquire it in a cold condition. Such belated absorption might be considered as due to germ origin, unless the conditions were carefully determined.

ABSORPTION OF ODOURS FROM COWSHEDS.

It is a current belief that milk does not take up odours so long as it is warmer than the surrounding air, and on this ground the practice of leaving the milk in the cowshed for a longer or shorter period of time is sometimes defended, more especially if the cans are arranged so as to preclude the possibility of the introduction of dust and dirt. This belief is not infrequently formulated in this way:—Milk evolves odours when warmer, and absorbs them when colder, than the surrounding air.

Recent experiments made by the writer seem to indicate that such a general conclusion cannot be experimentally verified. Exposure of hot and cold milk to an atmosphere charged with various vapours and odours, such as manure, urine, ensilage, and different volatile substances, showed that almost without exception both hot and cold milk absorbed distinctive odours in the course of a few hours to such an extent that they could readily be detected. Moreover, the intensity of the odour was almost invariably more pronounced in the warm than the cold sample, although precautions were taken to have the temperature of both samples alike at time of judging.

This belief, that warm milk does not readily absorb odours, is contrary to the housewife's experience who allows warm milk or warm food to cool before putting it into the refrigerator. Being warmer than the surrounding air, it absorbs more readily the odours arising from fruit, vegetables, or other food substances, than would be the case if it was first cooled down. Such a condition is not due to the retention of the "animal odours," but direct absorption from without.

The practical bearing of this is that milk should not be kept in contact with air that is saturated with undesirable or marked odours. Even an exposure for a half-hour has sometimes been found sufficient to impregnate the milk with the odour of decomposing manure. The straining of the milk in the cowshed, and then its immediate removal, may not give time for the absorption of odours in a marked degree, but it should be borne in mind that the conditions at that time are the most favourable for the rapid absorption of any odours, and that in milk that is being produced in the best possible manner even such an exposure is not to be recommended.

MILK AS RELATED TO PUBLIC HEALTH.

The presence of bacteria interferes not only with the keeping quality of the milk, but affects the sanitary conditions of the same. Bacteria are also intimately connected with the production of disease that the mere mention of the word calls up to the minds of many dread visions of epidemics. That all bacteria should thus be considered as enemies of man is entirely erroneous, for, in many cases, they are decidedly beneficial, and particularly is this true with reference to those forms found in the milk. The mere fact that milk invariably contains hundreds of thousands, if not millions, of bacteria per cc. need not in itself cause alarm. Mere numbers of bacteria are no just criterion as to the hygienic value of milk. Of course, just to the extent that bacterial life can be reduced in milk, just to that extent are the decomposition changes retarded, but milk or its by-products, skim milk or buttermilk, may contain scores of millions of germs and still be perfectly wholesome from a hygienic point of view.

The bacteria that exert a deleterious influence on human health are not necessarily those that are distinctively disease-producing—*i.e.*, pathogenic bacteria; for, in many cases, sickness is caused by the ingestion of milk that is contaminated by putrefactive organisms.

The bacteria that are of the most importance from a sanitary standpoint gain access to the milk in two ways:—(1) From a diseased condition of the cow; (2) subsequent to the withdrawal of milk from the animal.

No one will, willingly, consume milk from a diseased animal, yet it does not necessarily follow that the milk of all animals that are not in a condition of perfect health is not fit for use. Where the animal has a disease that also affects the human family, as in the case of tuberculosis, a danger exists that does not where the affection is confined to the bovine race.

TUBERCULOSIS AND PUBLIC HEALTH.

Perhaps more danger exists with reference to tuberculosis than with any other animal disease. Its widespread distribution, its insidious development, and the not infrequent infection of the milk-yielding organs, makes this question one of great importance to public health. Since the introduction of the tuberculin test, and the recognition of a greater prevalence of this disease than was heretofore supposed, the relation of this quality to the purity of public milk-suppliers has been made more prominent. While the extensive use of the tuberculin test is showing that the amount of bovine tuberculosis is much larger than was heretofore supposed, still it must not be considered that all animals that react to the test are actually in a condition where their milk supply is infectious. In much the larger number of cases of tuberculosis, the milk is entirely free from the specific organisms of this disease. Where the udder itself is involved, or where the disease is generalised throughout the lymphatic system, the milk very frequently contains disease germs in such quantities that infection of experimental animals results from the inoculation of small quantities of the milk.

The difficulty is that these conditions cannot be determined with certainty, and, therefore, there is always an element of uncertainty in using such milk. Then, again, suppose that the milk from a reacting animal was entirely free from contagious matter, how long would such a state continue is a question of practical importance. It not infrequently happens that an animal affected with a chronic latent type of the disease passes from such a stage to a more acute condition, where the disease makes rapid progress. Such a change often occurs as a sequel to some special tax on the system, as in calving, &c.

Therefore the only positively safe rule, as far as public milk supplies are concerned, is to reject the milk of all reacting animals, unless it is first treated in a way so as to destroy any tubercle germs that might be present.

There is another point that bears on the actual danger that exists in public supplies derived from mixed herds, and that is the influence of dilution of infected with healthy milk. The tubercle bacillus, unlike nearly all other disease-producing organisms, is unable to grow at ordinary air temperatures. It can thrive only at blood heat; therefore, if milk actually contains a certain number of tubercle organisms, these cannot increase in the milk after it is drawn from the cow.

The dilution of contaminated milk with milk from a number of other animals frequently diminishes the amount of infective virus per unit of volume to such an equal extent as to deprive it of its infective properties. Where the milk supply is derived from a single cow, special care should therefore be taken to determine whether the animal has bovine tuberculosis or not.

The conditions under which this disease is spread are of great importance, but this phase of the subject belongs more especially to a discussion of the general subject of bovine tuberculosis than to the relation of milk to public health.

DISSEMINATION OF DISEASE BY CONTAMINATION OF MILK SUBSEQUENT TO MILKING.

Milk affords a good culture medium for the development of a considerable number of disease germs that are unable to produce any diseased condition in the animal. These organisms gain access to the milk in a variety of ways, but, in general, they establish themselves through careless methods of handling the milk during, or subsequent to, its withdrawal.

TYPHOID FEVER.

The organism producing typhoid fever is able to withstand acids to a considerable degree; therefore, the natural increase in acidity in milk does not prevent the development of this disease organism, if it is once introduced into the milk. Scores of epidemics of this disease have had their origin traced to a contamination of the milk in a variety of ways. In some cases, the milker, convalescing from this disease, has resumed his work with the cattle, and thus given an opportunity for a direct transmission of the disease germs from the patient to the milk. More often the relation is an indirect one, the connecting link being some person who has served in the dual capacity of nurse and milker.

One of the most marked epidemics that have occurred in recent years was traced to faulty methods of cleaning the cans. The cans were cleaned with soap and hot water, and treated as they should be, with the exception that they were rinsed with *cold* water from a very shallow well that had been infected with typhoid organisms coming from sewage contamination. Where cases of typhoid fever, or, in fact, any other contagious disease, occur in the family of a dairyman, the greatest care should be exercised in order to prevent any possible contamination.

DIPHTHERIA AND OTHER DISEASES.

Diphtheria, scarlet fever, and cholera are diseases that are not infrequently spread by means of contaminated milk. The first two are, as a rule, disseminated through the medium of the air, so the infection of the milk must be guarded against with great care, where the disease is known to exist. Cholera is, usually, a water-borne disease, and the possible danger in this case is the same as in typhoid, where the utensils may be washed in infected water. The cholera organism is unable to withstand acids, and does not thrive in raw milk, but, nevertheless, a considerable number of instances have been noted where epidemics have been traced to the use of milk.

CHOLERA INFANTUM AND INTESTINAL DISORDERS.

The danger that exists from the foregoing diseases fades into comparative insignificance when we consider the intestinal disturbances in children, and their relation to the milk supply. To a very considerable extent, *Cholera infantum*, and the various intestinal difficulties that occur so frequently with young children, especially during the summer months, are due to the development of various species of bacteria that are present in the milk. These organisms belong to the putrefactive class, and, while not distinctively disease-producing, many of them are able to form poisonous substances therein, which, when absorbed into the susceptible digestive tract of young children, cause a variety of intestinal troubles.

The much higher mortality of bottle-fed, in comparison with breast-fed, infants, is attributable in a considerable degree to the infection of cows' milk that is used for food. The introduction of pasteurisation or sterilisation, by which germ life in the milk is destroyed, removes the cause, and thus prevents the formation of these poisonous compounds.

CHEESE-POISONING.

Cases of poisoning attributed to the eating of various foods by adults is also to be traced, in many instances, to a similar cause. Poisoning from eating cheese, ice-cream, and sometimes milk, is not infrequently recorded. Professor Vaughan, of Michigan, has succeeded in separating a highly toxic substance from cheese that had been used as food, and has given to it the name tyrotoxicon (cheese poison). He has also been able to find certain kinds of bacteria which when inoculated into milk and fed to animals would produce symptoms of violent poisoning. In almost every case where it has been possible to trace such a trouble back to its source, it has been determined that the milk had been kept under faulty conditions, where the opportunity for the development of these putrefactive bacteria was present.—*Hoard's Dairyman.*

THE DAIRYING INDUSTRY IN THE SOUTHERN COLONIES.

IN view of the work done by our own ever-increasing butter factories and creameries, it is interesting to note what our neighbours are doing in this direction. From our southern exchanges we select a few of the factories in Victoria and New South Wales for the purposes of comparison with our Queensland business:—

VICTORIA.

DROUIN.—There are now sixty suppliers at the Poowong Butter Factory, and the amount disbursed amongst them last pay-day was £400. The output, which is gradually increasing, is 3½ tons of butter per week, and the price paid for cream according to the butter result is 7¼d. per lb. Milk-suppliers are rapidly increasing, and dairymen generally look forward to an excellent season. The continuous heavy rains have so saturated the soil that it would take a severe drought to seriously injure the grass.

EUROA.—The Tamleugh and Karramomus Butter Factory during October received 79,652 gallons of milk, which yielded 33,627 lb. of butter. The directors paid the suppliers 2⅞d. per gallon for milk testing 3·6. The company's agent shipped 573 cases to London, the balance being sold in the Melbourne market, realising top prices.

GRANVILLE.—Mr. Potts, the chemical dairy expert, with Mr. Crowe, visited the Bass Valley Cheese and Butter Factory on Thursday, and expressed themselves as highly pleased with its management and condition. The experts delivered a suitable lecture to the children in the Bass Valley State School, and also at night in the local hall, to a good attendance of farmers and dairymen.

KILMORE.—The Kilmore Dairy Company received the following milk supply for the week ended 5th October:—Factory, 5,710¼ gallons; Moranding creamery, 3,052½ gallons; Tallarook, 2,454¾ gallons; High Camp Plain, 1,998½; Wallan, 2,031¼ gallons. Total, 15,247¼ gallons. The supply for week ended 22nd October was 13,458¼ gallons, and for week ended 29th October 14,992 gallons, so that the return shows a gradual increase.

POOWONG.—The balance-sheet of the Butter Factory Company for the half year ended 31st August shows a loss of £27 5s. 9d. The factory was closed for the greater part of the term, owing to the effects of the bush fires in January. The factory is now in full work, and is turning out nearly 4 tons of butter per week. The supply is rapidly increasing, there being abundance of grass.

SHEPPARTON.—At the Shepparton Butter Factory the milk supply for October totalled 200,543 gallons, being an increase of 38,670 gallons over the amount received the previous month. The average test for the whole supply was a fraction over 3·6, and the price paid for the milk was at the rate of 2⅞d. per gallon on a 3·6 standard. The highest individual average test was again obtained by Mr. Milenik, of Kialla West Creamery, who was paid on a 4·4 percentage for the month, Mr. McKendry, of Arcadia, being second on the test with a 4·1 average.

The Shepparton Butter Factory is turning out unsalted butter for export, the directors being under the impression that this class of butter will find a good demand in some parts of England.

WARRACKNABEAL.—Business in the local butter factory is most satisfactory. The manager reports that 27,233 gallons of milk were received during October, and that 3,000 lb. more butter were made than during October last year.

YARRAM.—At the October monthly meeting of directors of the South Gippsland Butter Factory, £1,110 8s. 8d. was paid suppliers for milk for the four weeks ending 11th instant. The number of gallons separated was 93,366,

Plate LXXVI.

CARTING WHEAT ON THE DARLING DOWNS.

producing 36,823 lb. of butter. The price paid for butter fat is 7d. per lb. For the corresponding period last year 102,381 gallons were received at the factory and branch creameries, producing 37,420 lb. of butter.

Yea.—The Yea Dairy Company is already projecting the erection of a creamery in the area that the new road over the ranges to Dropmore will open up. It will be the means of bringing within twelve miles of the railway a large area of dairying and grazing land which is now comparatively untenanted, owing to the absence of any road safe for vehicular traffic.

Rosebrook Cheese and Butter Factory Company.—At the half-yearly meeting of this company the balance-sheet submitted showed a profit of £124 on the six months, notwithstanding that the milk supply has fallen off about 25 per cent., even compared with the extremely bad season experienced last year. A dividend of 10 per cent. to the supplying shareholders and of 7 per cent. to non-suppliers was declared, whilst it was stated the average price paid per gallon for milk was 6d., this being the highest of any of the district factories during the same period. The sum of £3,548 had been disbursed in the purchase of milk, whilst the butter sold had realised £3,171, and the concentrated milk £1,513. The directors were empowered to purchase the factory building for the sum of £1,300.

NEW SOUTH WALES.

Last October the Taralga butter factory put through 18,500 gallons of milk for 6,500 lb. butter. Suppliers were paid from 2d. to 2·82d. per gallon.

It is reported from Robertson that the Beehive Dairy Company put through 11,300 gallons of milk during October for a return of 3,996 lb. butter. Suppliers were paid equal to 2$\frac{9}{16}$d. per gallon for milk.

The Waratah Dairy Company, at Kangaloon, put through 27,313 gallons of milk last October for 10,547 lb. of butter. Suppliers were paid 3d. per gallon.

The Pheasant Ground Dairy Company treated 7,421 gallons of milk last October for a return of 2,782 lb. of butter. Suppliers were paid 2½d. per gallon.

Last October the Jindiandy Dairy Company put through 109,680 gallons of milk. It was the largest supply of milk ever received by the company for one month.

For the month of October the Robertson Creamery received 65,050 lb. of cream, which returned 42,200 lb. of butter.

The Albion Park Dairy Company held its twenty-sixth half-yearly meeting 29th October, when a dividend of 7½ per cent. was declared. During the six months ended 30th September 351,810 gallons of milk were received at the factory, for which suppliers were paid an average price of 5$\frac{5}{16}$d. per gallon. The average price received for butter was 10¾d. Mr. J. S. Arnott has been elected auditor, and Messrs. J. Fraser, T. Armstrong, J. Dawes, and J. Burns were nominated as directors. Owing to the large increase in the supply of milk, the company has disposed of its old separators, and put down three on the very latest principles of construction.

The eleventh half-yearly report of the Tongarra Dairy Company shows that during the six months 27,996 gallons of milk were treated at the factory, producing 12,577 lb. of butter, being an average yield of 1 lb. of butter from 22 lb. 3 oz. of milk. The average price received for butter was a fraction over 11¼d. per lb. The average price paid suppliers for factory milk was 4⅜d. The milk was tested on an average at the rate of 3·95. The milk sent to Sydney totalled 23,393 gallons, which was paid for at the average rate of 6¼d. per gallon. Messrs. E. Hazelton and T. Rogan were appointed directors, and Mr. J. Isard auditor.

DENTITION OF CATTLE.

TELLING THE AGE BY THE TEETH.

IT has been stated that no accurate opinion of the age of a calf can be formed until it is six months old; at that time the fourth molars (the back teeth which are used for grinding) are well developed. Between six and twelve months there are no important dental changes; the incisor (front or cutting teeth) become worn, and more space is left between them, but it is not possible to assert from the state of the incisor teeth whether an animal is under or over the age of one year. At one year a bullock has eight incisors, and shortly afterwards the fifth molar appears. At the age of twenty or twenty-one months the two central incisors become loose, and their successors, the first two broad teeth, may begin to show themselves.

At one year and seven months, in very forward animals, the first pair of permanent or broad incisors are cut, but they are never level with the other incisors before one year and ten months, and their perfect development is indicative of the age of two years, at which time the sixth and last permanent molars are in position, and any error of opinion as to age, which might arise from the permanent (or early) cutting of the central permanent incisors, may be corrected by reference to the state of the molars. When the animal is a month or two over two years, the first and second (counting from the front) permanent molars take the places of the permanent teeth. From two years and three months or two years and six months, the second pair of broad, front, or incisor teeth, the middle permanent incisors, occupy the place of the corresponding temporary teeth in all cultivated breeds. Instances of late dentition present themselves from time to time, in which the middle permanent incisors are not cut till the animal is approaching three years old. There is consequently a possible variation of six months in the time of the appearance of these teeth. It must be understood, in reference to the appearance of the second pair of broad teeth, that an expert, looking at a mouth which has four permanent incisors, will conclude that the animal is two years and a-half old; but if he is required to certify that the age is under or above that period, he must proceed to inspect the molar teeth, and take into account the animal's pedigree, its sex, and its general condition of development. If the animal in question is a bull, and has been forced to early maturity, it may be expected that the second pair of permanent incisors will be cut at two years and four months; and if either of the anterior (foremost) temporary molars remain in their places, the conclusion that the animal is under two years and a-half will be strengthened. Shortly after the first and second molars are cut, the third makes its appearance; occasionally it appears before the others, and the animal at the age of three years will have three anterior molars nearly level with the other teeth, but showing no signs of wear. The eruption of the third pair of permanent incisors may occur at any time between two years and six months and three years of age.

The anterior molars, however, afford more reliable evidence of the age between two and a-half and three years old than is furnished by the incisors. At three years of age the average condition of the teeth in cultivated breeds is —the fourth pair, or the corner permanent incisors, are well up, but they vary considerably. In well-bred cattle they take the place of the temporary teeth soon after the completion of the third year. In well-bred bulls they are often present at two years and ten months, while in some instances they are not cut till the animal is three years and nine months. Very little reliance indeed can be placed on the corner incisors, and the examiner is compelled to refer to the molar teeth to correct his opinion. With the exception of the corner permanent incisors, the fourth pair of broad teeth, the permanent dentition of the ox is completed, and after this period the changes in the form of the teeth from effects of attrition will assist the examiner in forming an opinion of the age. —*Farmer and Stockbreeder.*

ANILINE IN BUTTER-COLOUR.

WE make the following extracts from a communication sent to *Farm and Dairy*, New South Wales, by the New South Wales Fresh Food and Ice Company, at the instance of the Danish Butter Colour Company, Copenhagen:—

Consequent upon the application of aniline in the manufacture of butter colour, the well-known factory of dairy preparation and the inventors of the "lactic acid ferment," of world-wide reputation, which has caused so great an improvement in the quality of butter, Messrs. Blauenfeldt and Tvede, at Copenhagen, Denmark, have sent the following circular to all the dairies in Denmark:—

The *Molkereizeitung*, having in February, 1896, brought an article from the pen of the Danish consulting officer, Boggild, wherein the application of aniline was condemned most strongly, and consulting officer for the State, Nissen-Dall, in an address, seriously warned against the use of this colouring matter, one should assume that butter-colouring with aniline was excluded from the dairies, especially as it subsequently has become known that butter coloured with aniline and margarine, by means of certain analytical tests, could react in one and the same way.

We received, meanwhile, at the close of last summer, from several of our English business friends, inquiries which caused us to examine somewhat closer these circumstances, and it turned out that there was to be found a great deal of Swedish and Norwegian, as well as Finland, Danish, and Sleswig butter which was coloured with aniline, and that there was, to a large extent, sold, butter which in taste and smell resembled butter-colour, but which at its examination proved itself to be a mixture of orlean and aniline, no doubt produced in happy unconsciousness of the fact that both substances could be separated from each other, and each one traced by itself.

On account of these results, we spoke our mind and made dairies as well as the dairy authorities of this country acquainted with these circumstances. By means of a circular, which we distributed at the Kolding Exhibition, and, later, sent out to all Danish customers, we at the same time gave the dairies directions in an easy way by own help to examine the colour to be used, and thereby to protect themselves against any intermixture of aniline into the butter. This direction we give herewith below.

In conclusion, we beg to remark that the dairies must not use any butter-colour mixed with aniline if they will not subject their butter to the suspicion that it contains margarine.

Also, all other countries which produce butter should, in order to prevent an adulteration of butter through margarine, strictly take heed that only aniline free butter-colour is used.

DIRECTION FOR ANALYSIS.

Pour a few drops of butter-colour upon a white china plate and over-pour these with a few drops of pure concentrated sulphuric acid.

If the butter-colour is vegetable colour (orlean or orlean seed), there appears a dark bluish-green colour, which gradually goes over to greenish-yellow.

If the butter-colour, however, contains aniline eller tar colour, there appears, by adding sulphuric acid, a red margin, or red spots, which gradually spread themselves over the whole.

JERSEY COWS.

THE average yield of milk from a good Jersey cow, fed on artificial food, and milked twice a day, should be about 450 gallons a year. Some cows give as much as 700 gallons a year.

The quantity of butter which may be expected from such a cow—*i.e.*, one giving 450 gallons—is 200 lb.

If the milk test shows 3·6 of butter-fat, then 25 lb. of milk will produce 1 lb. of butter. If the cream shows 40 per cent. of butter-fat, 2 lb. of cream will produce 1 lb. of butter. A gallon of milk weighs 10·25 (or 10¼) lb. The price of milk and cream paid by the factories all the year round is regulated by the market price of butter, the standard being 3·6 per cent. of butter-fat.

As bearing out the above statements (which will furnish answers to several questions put to us by a correspondent), we instance some Jersey cows at the Queensland Agricultural College.

Under the management of the Principal, Mr. John Mahon, the general dairy herd has improved by leaps and bounds. One Jersey cow, which has been milking for six months, and may probably go on milking for another twelve months, has given an immense yield of milk. We take the month of October. In that month she was under our own observation, and her record was 713 lb. of milk, which yielded 39 lb. of butter, the test showing 4·8 of butter-fat.

Another Jersey gave 28·32 lb. of butter from 749 lb. of milk, during the same month; the test showing 3·4 of butter-fat.

Yet another gave 30·19 lb. of commercial butter, with 3·6 of butter-fat, from the same quantity of milk (749 lb.).

With 4 per cent. of butter-fat, a fourth of the Jerseys gave 29·16 lb. of butter for the month.

This month is chosen because fodder was rather scarce, the ensilage was finished, and the rations consisted of green maize and lucerne fodder with a little bran and molasses.

The average monthly yield from twenty cows was 25 lb. of commercial butter.

Now, taking the first of these cows, we find that she gives milk at the rate of 8,556 lb. of milk per annum (her record having been steady, and occasionally, with barley ensilage, showing a greater yield).

A gallon of milk weighing, as we have shown, 10¼ lb., she yields nearly 835 gallons a year.

The milking record of the others may be calculated in the same way.

As there is now a large amount of green fodder available on the College farm, it is pretty certain that these cows will yet improve, and break their record.

Owing to want of stall accommodation, a thorough system of feeding cannot yet be carried out at the College, as, although feed is available, sufficient time cannot be allowed for each animal to be thoroughly and satisfactorily fed, as one batch, after being milked, has to be turned out to make room for the next. This will, however, shortly be remedied—plans of new and extensive cowsheds having been prepared.

The actual returns from the dairy for the month of October are as follow. Number of cows milked 40, some of which are the old inferior stock :—

	£	s.	d.
Butter produced, 438 lb., at 1s. per lb.	21	18	0
Milk produced, 465 gals., at 4d. per gal. ...	7	15	0
Cheese produced, from 20th October to 31st October, 447 lb., at 8d. per lb.	14	18	0
Pigs sold, two at 35s. each	3	10	0
Pigs on hand ready for market, twenty at £2 ...	40	0	0
	£88	1	0

THE COLLEGE PURE-BREDS AND CROSSES.

Name of Cow.	Breed.	Test.	Commercial Butter.	Amount of Milk.
			lb.	lb.
Lena	Ayrshire	3·8	28·34	651
Laverock	"	3·4	27·14	718
Rosebud	"	3·4	23.6	420
Rheam Ruthie	"	3·3	21·76	589
Linnet	"	3·3	21·40	775
Lavinia	"	3·5	21·89	558
Eileen	Jersey	3·7	28·1	558
Stumpy	"	4·8	39·46	837
Jersey Belle	"	4·0	29·16	651
Content	"	4·8	22·4	527
Baroness	"	3·9	25·6	689
Conny	"	3·9	16·9	387
Whitefoot	Cross	3·4	37·0	713
Laurel	"	3·4	38·32	744
Jane...	"	3·6	30·19	749
Empress	"	3·3	25·31	685
Rosella	"	3·6	25·2	645
Russet	"	3·5	23·2	592

The average monthly yield of butter per cow was over 25 lb., the butter selling at 1s. per lb., each cow thus returning on an average 25s. every four weeks.

Each animal consumed about 12 lb. of ensilage daily, conserved from Cape barley and oats, the cattle being, of course, allowed to pasture in the ordinary grass paddocks.

The Orchard.

FRUIT CULTURE IN QUEENSLAND.

By ALBERT H. BENSON.

GRAFTING.

CONTINUING the subject of the propagation of fruit trees, I purpose dealing with the various methods of grafting in the present article, having dealt with budding and propagation from seed in a previous number of this *Journal*.

The object of grafting is similar to that of budding—viz., to propagate any given variety of fruit true to kind, or to convert unsuitable or unprofitable varieties into suitable or profitable ones.

Grafting differs from budding in that, in the latter operation, a single bud only is taken, whereas in grafting a portion of the previous season's wood that is well ripened, and containing from one to four or more buds, is used. Budding can only be successfully carried out when the stock is in a state of active growth; but grafting, other than that of bark or rind grafting, which is presently described, is most successfully carried out in spring, just previous to the commencement of active growth.

Grafting is applicable to fruit trees of all kinds and sizes, from nursery stock to large trees, different methods being used for different kinds and different sizes of trees.

The tools required for grafting consist of the following:—

1st. A strong pruning-knife, having either a straight or curved blade, according to the taste of the operator, some preferring one shape and some another, with which to prepare the stock. Saynor's knives, which are known to and are generally used by all professional gardeners, and which can be obtained from any good firm of nurserymen, seedsmen, or ironmongers in the colony, are, in my opinion, the most suitable for this work.

2nd. A knife having a thin straight blade with which to prepare the scions; a strong budding-knife answers well.

3rd. A good pruning-saw, such as the "California," which was illustrated and described in the article on "Pruning." When the trees to be grafted are of large size, a handsaw is required.

4th. A strong chisel and wooden mallet for preparing large stocks.

5th. A grafting-pot in which to prepare the grafting-wax. An ordinary gluepot is suitable for this purpose.

6th. Materials for making grafting-wax, such as beeswax, tallow, resin, turpentine, &c.

7th. Materials for tying grafts, such as thin calico, raffia, cottonwick, &c.

All tools used in grafting should be kept in good order, knives especially so, as it is difficult to cut a good-fitting graft with a blunt knife, and not only that, but the cleaner and neater the cut the more certain and perfect the union.

Grafting-wax, which is used for all grafts above ground, is made in several ways. One recipe consists of melting together, over a slow fire, equal parts of beeswax, resin, and tallow till dissolved and thoroughly mixed, when it is ready to apply, and another good wax is made as follows. Take of—

Beeswax	1 lb.
Tallow	½ lb.
Resin	1 lb.
Turpentine	2 oz.

Melt the resin and tallow over a slow fire; then add the wax, and, when melted, mix well together. Then add the turpentine and stir well, when it is ready to use.

Grafting-wax is applied hot with a brush to the graft when tied in position, care being taken to cover the wound carefully so as to exclude the air. A simple and convenient way of using the wax in the case of nursery stocks is to dip a sheet of thin calico into the boiling wax, and, when cold, tearing the waxed calico into narrow strips of suitable length. The graft being placed in position, the waxed tie is wound round it, so as to completely cover the union; the heat of the hand being sufficient to soften the wax, so that it sticks well and is airtight.

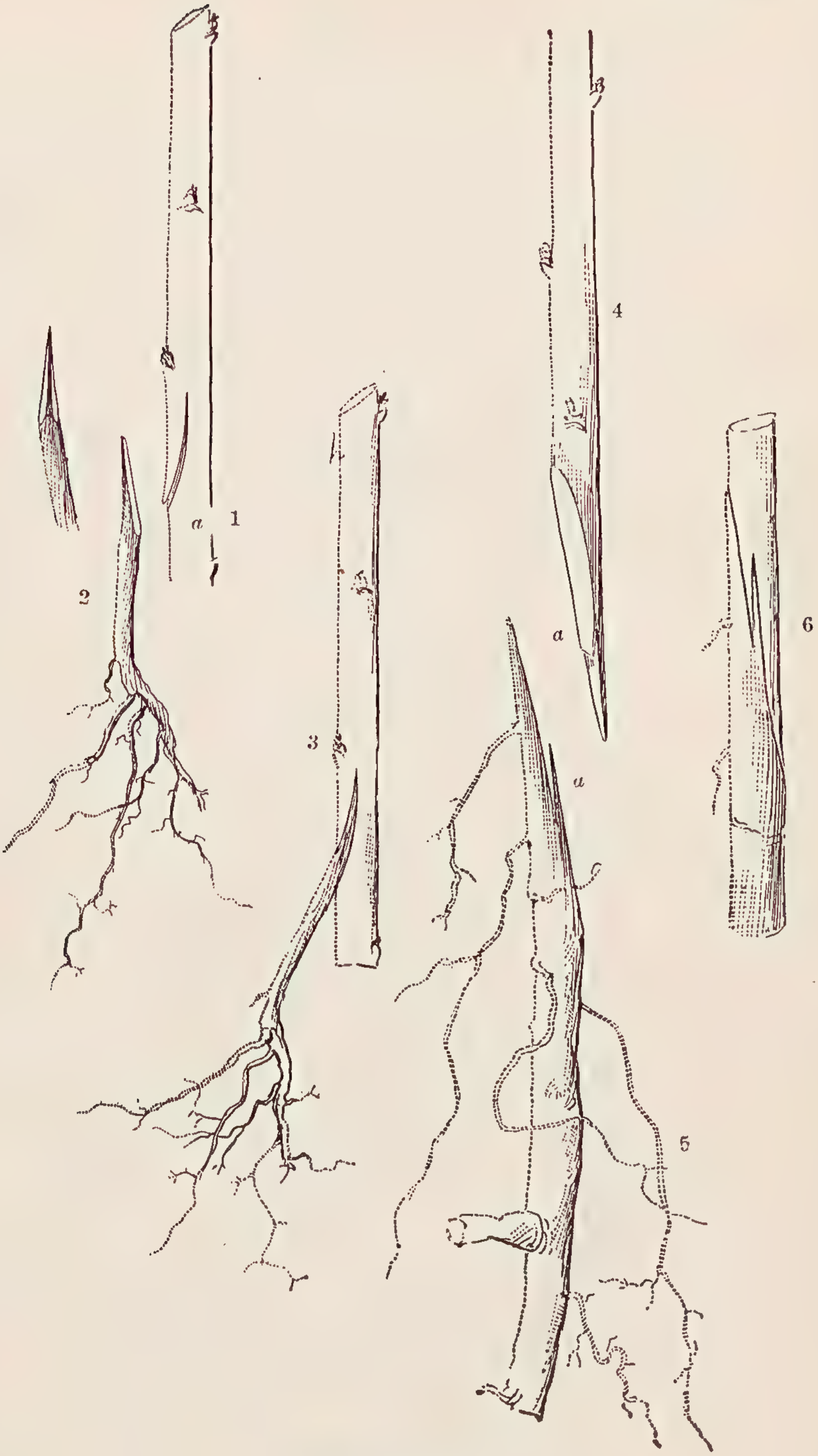
The principle of every method of grafting, whereby the scion or graft is made to unite with the stock, is the bringing together of the Cambium layer of each, as this Cambium layer is the growing or wood-producing portion of the stock and scion; and when the two layers are brought together and kept together without air, they each throw out new cells, which join together and form one layer of wood.

No union can take place between the scion and the stock, unless the Cambium layers of each are brought into and are kept directly in contact with each other, and the best means of doing this are shown in the various methods to be presently described. There are various methods of grafting used for different varieties of fruit trees and for the different sizes of stocks to be worked, but the principle is the same right through. I will now deal with several methods of grafting, the description being accompanied by illustrations drawn from life by Mr. F. C. Wills, the artist to this Department.

ROOT-GRAFTING.

There are two kinds of root-grafting. In the first, a small piece of root is grafted on to a scion of the variety it is wished to propagate; and in the second, the scion is grafted on to the root stock just below the ground where the stock is standing in the nursery row, or the stocks are dug up and grafted in a shed or other suitable building, and when grafted are either heeled in temporarily in sand or are planted out in the nursery row. This is known as bench-grafting, and, on account of the ease and rapidity with which it can be done, is often used by nurserymen. In the first case, where a small piece of root is grafted on to the scion, there are two methods employed—one where the root is smaller than the scion, and the second where the root is as large or larger than the scion. These methods of grafting are chiefly used by nurserymen for the propagation of blight-resistant apple stocks, the Northern Spy or Winter Majetin varieties being chiefly used, as both are free rooters when root grafted.

Plate LXXVII.



ROOT GRAFTING.

When the root is smaller than the scion, a sloping cut is made into the scion as shown at *a* (see Fig. 1), taking care to use a sharp thin knife, and making a drawing and not a forcing cut, so as not to split the scion; and the root (see Fig. 2) is prepared as shown in a similar manner to the wedge graft used in the case of large trees, and presently described. The root as prepared is then inserted into the cut *a* made in the scion as shown in Fig. 3, and is then tied firmly in place with raffia or thin calico—no waxing is necessary. Where the root is as large as or larger than the scion, a whip or splice graft is used, which is best described by reference to the illustrations: Fig. 4, the scion, showing the sloping cut and tongue at *a;* Fig. 5, the root, showing the sloping cut and tongue at *a;* Fig. 6, the completed graft, showing the use of the tongues and how they fit.

In the illustrations the root and scion are shown to be of equal size, but if the root is larger than the scion then it is essential that the inner bark of one side of the root and of one side of the scion be brought in contact, taking no notice of the other side, as a union on one side is sufficient. Always tie the grafts firmly, so that there is no fear of shifting once they are placed in position and tied. Root-grafting as described can be done during the winter or early spring, the grafts when made being either kept in sand till the nursery is ready or planted out in nursery row direct.

In the second place, when the scion is grafted on to the seedling or other root stock, the method employed is that of whip-grafting just described, the scion being tied firmly in place, but not waxed, and the soil being then drawn round the graft till only one bud of the scion is left above ground. If there is danger of the graft drying out, then waxed ties can be used. This method of grafting on to the root stock is used largely in nurseries, especially in the case of peaches and other fruits having a soft pithy wood, and is done in spring just as the sap is beginning to move in the stock, the scion, if possible, being more backward in growth than the stock.

WHIP OR SPLICE GRAFTING.

This is probably the commonest and best method of grafting nursery stocks, as it is applicable to stocks varying in thickness from that of an ordinary lead pencil to stocks of an inch, or even slightly more, in diameter. The tongue holds the graft in place, and when the cuts are properly made the graft fits well. When the stock and scion are of equal size, the completed graft should appear as in Fig. 7, the scion and stock being cut in a similar manner to that shown in Figs. 4 and 5; but when the stock is larger than the scion, instead of making a sloping cut right through the stock, a sloping cut on one side of it is sufficient; a tongue is made in this cut, and the scion fitted to it, care being taken that the inner barks of the scion and stock meet on one side (see Fig. 8). In preparing the stock the top should be cut off with a slight slope, and the scion should always be placed on the higher side, so that the bark will grow over the wound and leave no dead wood, as would be the case were the scion put on the lower side of the slope. When the graft has been placed in position, it should be firmly tied with any suitable material or with waxed calico, and the whole of the cut, including the top of the stock, should be covered with hot grafting-wax, so as to exclude air and moisture. Whip-grafting of nursery stocks should be done at a height of about 6 inches from the ground, and the grafts or scions need not contain more than two or three buds.

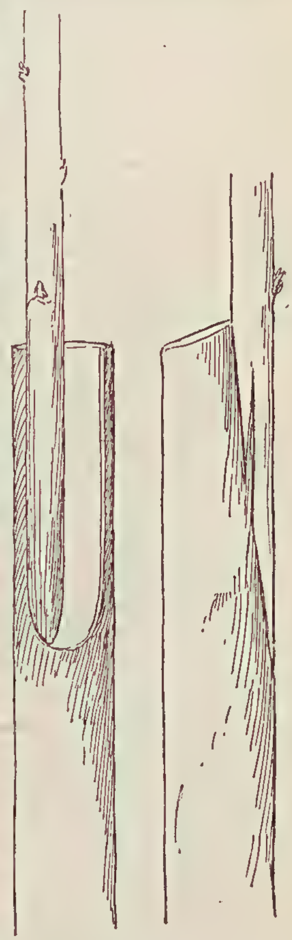


FIG. 8.

BARK OR RIND GRAFTING.

This method of grafting can be used with trees of all kinds and of all sizes from nursery stocks to old trees that have to be worked over. Unlike the previous methods, bark-grafting can only be done when the bark of the stock runs freely. When small, the stock is cut off square or with a slight slope, and a cut is made through the bark on the upper side as shown in Fig. 9, the bark on either side of the cut being carefully lifted. The scion is cut as shown in Fig. 10. It should be cut fine, and be well shouldered to insure a good fit. When placed in position (see Fig. 11), the graft should be at once tied and waxed. In making this graft the less the inner bark of the stock is exposed the better, so that it is not advisable to lift the edges of the cut more than is absolutely necessary, but rather to let the scion force its own way. In grafting large stocks, by this method two or more scions may be inserted in the same stock if desirable, so that if one misses another will take its place. In preparing large stocks the top should be cut off quite square, and the edges should be well trimmed with a sharp knife, so that the bark shall grow over and cover up the wound, which should be carefully waxed.

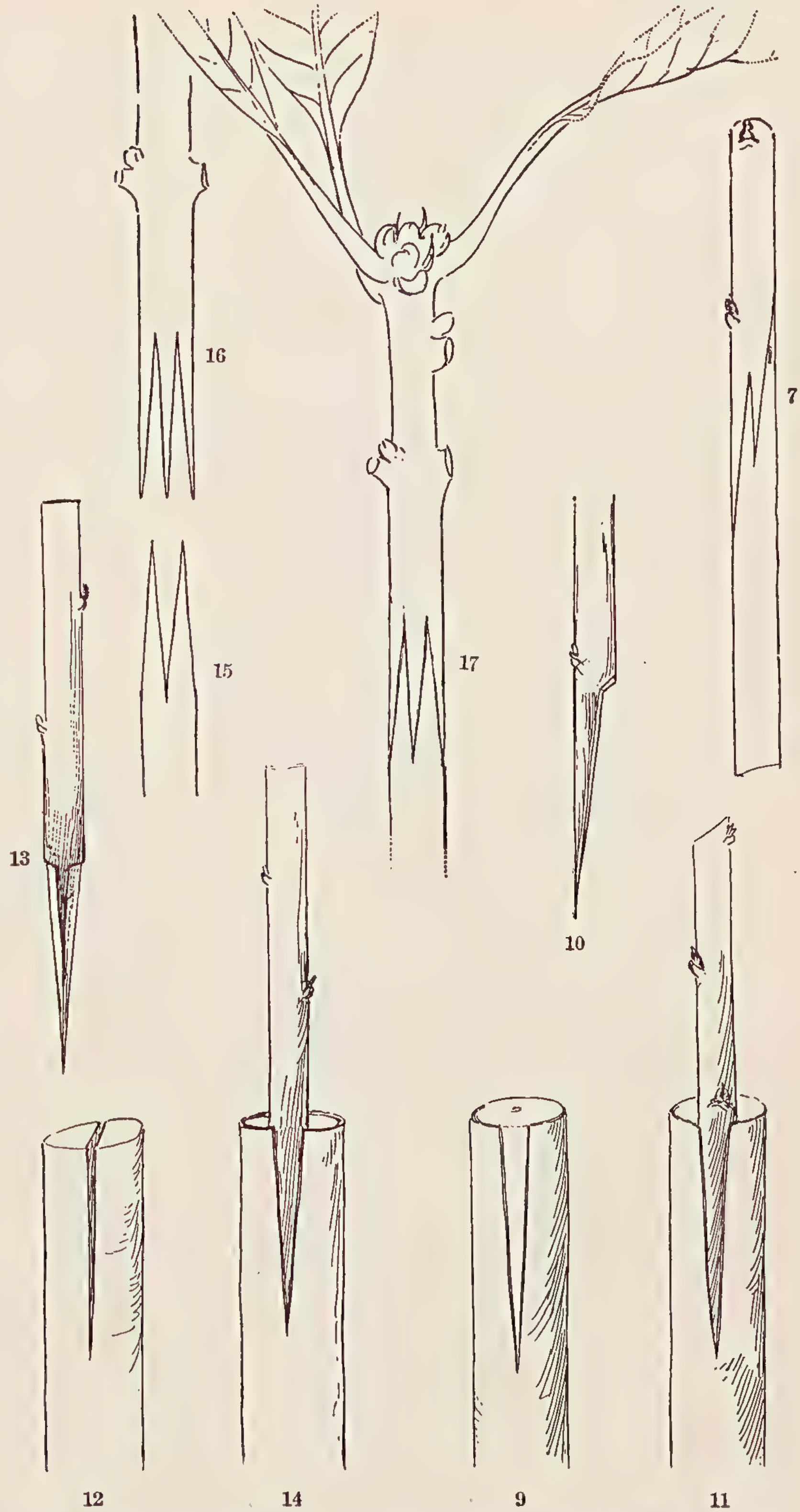
CLEFT OR WEDGE GRAFTING.

This method of grafting is also applicable to all sizes of stocks except very small ones; but where the whip graft can be used it is better to use this method than wedge-grafting, as the latter has the disadvantage of splitting, and thereby more or less injuring the stock. For large stocks, however, it is still in common use. The stock is cut off square, the edges of the cut trimmed, and then it is split open with a chisel (see Fig. 12). If the stock is large, the cut is kept open by the insertion of a small wooden wedge to prevent the pressure from injuring the scion when inserted. The scion (see Fig. 13) is cut in the shape of a wedge, tapering both from the shoulder of the graft to the point and from the bark to the centre, so that when inserted into the stock it fits well, and the inner barks join. Do not take any notice of the outer bark, but see that the inner barks join (see Fig. 14). A graft can be placed at each side of the cleft, if desired. When inserted, the scions should be tied in place, and the whole should be carefully waxed, the cleft being filled with wax to keep out the rain. This method of grafting should be done just as the sap begins to move in the stock in spring.

SADDLE-GRAFTING.

This method is now seldom used, and I only mention it on account of the success that Mr. J. Henderson, the manager of the Redland Bay Experiment Orchard, has had with it in the grafting of mangoes. Mr. Henderson has used a double saddle graft on young seedling mango stocks, the stock and scion being cut as shown in Figs. 15 and 16, the stock and scion being of the same size. The graft when completed (see Fig. 17) is firmly tied but not waxed, and the earth is brought round it. This graft is put on when the mango is in *full growth*, and the young plants when worked are shaded from the sun. As far as I know this is the first time that young seedling mangoes have been grafted successfully in this colony by any other method than that of inarching, which is a tedious and expensive process, as, although I have myself succeeded in root-grafting and bark-grafting mango stocks, I have not been as successful as Mr. Henderson, as my root and bark grafts have not taken as well as his double saddle grafts. To make this graft successfully, a very sharp and thin knife is essential, as the scion must fit perfectly. I therefore hope that Mr. Henderson's success with this method of grafting will be of great value to the mango-growers of this colony, as it will enable them to propagate valuable varieties instead of depending on seedlings, which so often turn out to be utterly worthless.

Plate LXXVIII.



WHIP OR SPLICE GRAFTING, BARK OR RIND GRAFTING, CLEFT OR WEDGE GRAFTING, AND SADDLE GRAFTING.

INARCHING.

Inarching or grafting by approach is the method commonly employed in India for the propagation of the finer varieties of mangoes, and consists in bringing a seedling mango plant in a pot to the tree from which the scion is to be obtained, and placing it in such a position, probably on a stage, that the portion of the tree that it is desired to propagate can be brought into direct contact with it. A thin slice is then taken off one side of the seedling, about two or three inches in length, and a corresponding slice is taken off the branch of the tree that is to be used as a scion, care being taken to select a branch of the same diameter as the seedling. The cut surfaces are then placed together, taking care that the inner barks on both sides of the cuts join, and are firmly tied in place with soft calico. The graft is not waxed, but is kept moist by water constantly dropping on to it. When a union has taken place, the scion is severed from the parent tree, and the young plant is ready for removing. Great care is necessary to prevent the scion from breaking off, as the union at first is very slight, and it is generally a considerable time before the union is thoroughly strong. This method of grafting is tedious and expensive, and should not be attempted by anyone who has not the time to attend to the grafts properly, as if neglected they will never make a union.

Viticulture.

VINTAGE OPERATIONS.

By E. H. Rainford,
Viticulturist, Queensland Agricultural Department.

As the vintage in the earlier districts of the colony is approaching, a few words on this important part of viticultural operations will be opportune. It is unfortunately a matter of belief with some that the questions of cleanliness of surroundings, temperature of the fermenting must, &c., is of little or no importance, and that all that is necessary to make wine is to crush the grapes and ferment the juice anyhow, and if after danger threatens, such as refermentation, acidification, or any of the ills which badly-made wine is heir to, the trouble can be overcome by a dose of antiseptic, and the wine is safeguarded. Let us hope that such unscientific and improper methods are adopted by a small minority, and that the bulk of vignerons in the colony are aware of the superiority of wine made without such addition. The wine that has been made from fresh-picked grapes, fermented at a proper temperature, in clean sweet vats and casks, has fruitiness, bouquet, and *finesse* of quality, which is wanting in a wine made differently; the former will keep sound naturally, the latter is in constant trouble unless doctored as already mentioned.

Those vignerons who care to take advantage of the writer's lengthy experience in wine-making, and who desire to work upon those lines laid down by all men of viticultural experience throughout the world, are recommended to adopt the procedure described below where it is possible to do so.

CLEANLINESS OF PLANT AND SURROUNDINGS.

The first point to be attended to before the vintage commences and a single grape is picked is to see that the casks, vats, crusher, press, and buckets, as well as the cellar itself, are in a condition fit for use. The danger of using

unclean plant is twofold. First, the wooden material saturated last season with must may have become mouldy, which would communicate disagreeable tastes to the wine; second, dirty plant may be swarming with germs of bacteria or their spores, which would not fail to multiply in the must, and thereby affect its soundness and quality. Where vats and casks have a decidedly bad smell, the reader is referred to last month's article in this *Journal* for their treatment. When they have only the usual smell of dry cask, they should be washed out and scrubbed with a bucket or two of water acidified with sulphuric acid. A vat-full can be prepared beforehand in the proportion of 2 lb. of acid to 100 gallons of water. Wash all the plant down with this solution; it is too weak in acid to affect the ironwork, but is a splendid germ-destroyer and sweetener of tainted wood. If the vigneron cannot or will not use the acidified water, he can wash the plant with a 5 per cent. solution of bisulphite of lime (obtainable at breweries). If a large fermenting vat has become mouldy and green inside, as will happen if kept in a damp place, it is well to burn the interior surface with a plumber's lamp, and then well scrub down with salt water, sulphuric acid solution, or bisulphite solution.

Cleanliness of surroundings should also be attended to, keeping the cellar clean and sweet by occasionally whitewashing the walls and sweeping up all refuse—bruised grapes, husks, &c., lying about, breed countless germs.

ACIDITY OF MUST.

Mention was made in the article for this *Journal* for February, 1898, that for the germs of vinous fermentation to do their work efficiently the constituent parts of the must should be in equilibrium, and when the proportion of tartaric acid falls too low, the *Saccharomyces* lose some of their vitality, while that of the noxious germs is increased. In addition to the effect upon fermentation, the wine will be flat to the taste, imperfect in colour, and wanting in bouquet, and, moreover, it will always be susceptible of change and deterioration. Wine made from must with sufficient acidity will be of a lively colour, fruity, and with a pleasant bouquet, besides keeping much better.

If grapes are allowed to become too ripe, they lose acidity, and the must will be deficient; on the other hand, if in some places grapes are vintaged too early, they will lose in sugar, so that it is preferable to add a little tartaric acid to musts of ripe and over-ripe grapes—a practice permitted in all wine-making countries.

Again, in wet seasons the must will be deficient in tartaric acid, and also that from grapes affected with cryptogamic diseases (oidium, black spot, &c.)

Conversely, during very dry seasons, or when grapes have matured with a long spell of dry weather and burning sun, the must rarely requires any addition of acid.

The quantity to be added will, of course, depend upon the amount already contained in the must, and this can only be known by testing with a proper apparatus. For those who do not possess the apparatus and practical knowledge of testing, the best plan is to send an average sample of the grapes to be vintaged to this Department a day or two before picking to be tested, and the acidity will be made known by return of post. Must from the generality of wine grapes requires from 8 to 10 per mille of tartaric acid, and that from Jacquez or Lenoir not less than 12 per mille, otherwise a portion of the colour will not be fixed, but will deposit in the lees. One per mille may be calculated as 1 lb. per 100 gallons, so that, if a Lenoir must only contains 10 per mille of acidity, 2 lb. of tartaric acid must be added to each 100 gallons of must if all the colour is wanted; if the amount of colour is immaterial, the acid need not be added, as 10 per mille is sufficient for the preservation of the wine. On the hand, if a Hermitage or Espar must only contains 6 per mille of acidity, 2 per mille should be added, as its acidity is too low to ensure soundness and quality.

The acid should invariably be added to the must before fermentation and not after, as in the latter case it only communicates a harsh sourness to the wine without benefiting it in any way. The best method is to sprinkle it on the grapes as they are crushed, a little at a time.

CRUSHING.

Before crushing, pick off all unsound grapes, if possible; and when they have been picked over twenty-four hours and have travelled some distance, the bunches should be washed with a stream of water from tap or hose. The object in both cases is to remove the bacteria which are swarming in the unsound and broken berries. When crushing with a mill it is not advisable to place the crusher directly over the vat, unless the latter is very large, as by doing so the must will not get sufficient aerification from too low a fall. It is better to have the crusher at a certain elevation, and allow the must to run down a wooden shoot into the vat, which will allow sufficient oxygen to be absorbed to assist in the fermentation. Where this is not practicable, the must should be racked from the bottom to the top of the vat for a short time with tap and bucket. Must from grapes which have been trodden requires no artificial aerification, as by this process the must is thoroughly aerated naturally.

FERMENTATION.

STARTING A HEALTHY FERMENTATION.

The must in the fermenting vat or cask will, if these are "cold," or have not contained fermenting must lately, require twelve hours to enter into fermentation, and more if the weather is cold. This gives a chance for some of the noxious bacteria to develop contemporaneously with the *Saccharomyces*, which should be avoided if possible. An excellent way of doing so, and starting a quick healthy fermentation, is to prepare, twenty-four hours previously, a yeast from the soundest and best quality grapes in the vineyard, pressed by hand into a very clean pan or tub covered with a clean linen cloth. A gallon or two of this, mixed a little at a time with the grapes as they are crushed, will at once start a fermentation free of bacterial contamination. The writer has constantly adopted this expedient with favourable results.

TEMPERATURE DURING FERMENTATION.

The most important point to attend to during this critical period is the temperature of the fermenting must. Too low or too high a temperature will affect the regular course of the fermentation with dangerous and even disastrous results to the wine. The danger of too low a temperature is one that is highly unlikely to occur in this colony, and may be dismissed, but the second is a danger that should be carefully provided against. The *Saccharomyces* or vinous ferment germs do their work of transforming the sugar into alcohol and other substances most perfectly at a temperature of 80 degrees to 90 degrees. At 95 degrees the germs will still complete their work, but not with such energy as at the lower figures. As the temperature rises above 95 degrees, the activity of the germs gets more and more feeble, until, at about 110 degrees, their action ceases—they are dead or paralysed.

Let us examine for a moment how a high temperature affects the fermenting must. When grapes are crushed, the must is sown with the spores not only of the *Saccharomyces ellipsoideus* adhering to the skins, but also with the spores of the *Micoderma* (or mildew), and the bacteria of lactic, acetic, and other fermentations. These latter may be adherent to the fermenting vats and other plant in use, or may be conveyed by the atmosphere. So long as the must is kept at a temperature favourable for the development and reproduction of the *Saccharomyces*, the inimical germs are, so to say, crowded out and their functions impeded. The sugar is transformed into alcohol and the other products of vinous fermentation, and a good sound wine is the result. But as

the temperature mounts and the vitality of the saccharomyces becomes weakened, the bacteria, which at first were unable to find room begin to multiply, especially if the must is deficient in acidity. There arrives a point at which the work of the *Saccharomyces* ceases—they are either killed or paralysed—the must ceases to ferment. All this time the lactic and other germs, which can live and perform their functions in a much higher temperature than the *Saccharomyces*, are converting the sugar into lactic and acetic acids with a more or less disastrous effect upon the quality and keeping powers of the wine. The *Saccharomyces* never properly resume their functions after the wine has cooled down, and it remains muddy with a sweet acid taste. Frequently, when too high a temperature has caused the collapse of the vinous fermentation, what is known as mannitic fermentation commences, which is the work of a bacteria, which converts the sugar into mannitic and acetic acid.

An instance of fermentation at too high a temperature once occurred in the writer's cellar, in Sicily. The must was white must of the Marsala varieties of grape registering 27 degrees of sugar by the saccharometer. By a combination of causes, the must was fermented in one large cask of 1,800 gallons capacity, instead of, as usually, in a number of smaller ones. Within forty-eight hours the fermentation had reached its maximum intensity, and the temperature of the must was so high as to feel quite hot to the hand, and the usual appliances were quite incapable of reducing it. During the night the fermentation totally ceased, and by the fall of the gross lees, the wine rapidly cleared; it was quite hot and still very sweet. It remained in this state all day, and then, apparently, fermentation recommenced, for a hissing sound was heard at the bunghole. This, however, was only the escape of the carbonic acid from a new fermentation caused by lactic or mannitic germs, which were converting the sugar into lactic or acetic acids, the high temperature favouring their activity, and very soon the wine acquired a sweet-sour taste, with a disagreeable smell, and eventually had to be sold for distillation.

The cessation of the vinous fermentation, as described above, is known as "stuck" wine, and prompt measures must be taken if it is to be saved. The best way of proceeding is to rack off the wine into two or more vats, and to add to it an equal quantity of fresh must, if possible, in a fermenting condition; if the fresh must is not fermenting, put into each vat several gallons of fermenting must from another source, so as to restore the vinous fermentation as quickly as possible, and not allow time for the lactic or other germs to get into play, at the same time cooling the vats as explained later on.

The good old proverb, "Prevention is better than cure," is applicable to many things in life, but to none more than to wine-making; and if the vigneron neglects to bear it in mind, he will have to cogitate on another which says, "What can't be cured must be endured," so instead of having to tackle a "stuck" vat, and spoiling wine, with all the attendant hurry-scurry and anxiety, it is better to take those precautions which will prevent it.

COOLING ARRANGEMENTS.

If the weather is very hot, do not gather and crush the grapes during the heat of the day, but only in the morning, or, if gathered all day, leave them to cool for a night.

Avoid the use of too large-sized vats; those of 500 gallons capacity are quite large enough for a moderate-sized vineyard, and these can be kept cool by very simple means. Should the temperature within rise too high, vats of larger size than this will probably require a cooling apparatus, unless in cool, underground cellars. Should it be necessary to cool small vats up to 500 gallons, it can generally be done sufficiently by enveloping them in wet sacking, sprinkling it occasionally with water. As it dries, the evaporation from the sacking takes off a certain amount of heat. Better still is to have immersed in the must a metal (tinned) cylinder containing a refrigerating mixture of ice and salt, which should be occasionally stirred. A few pounds of ice used in this way will considerably reduce the

temperature when it has risen to a dangerous point, care being taken not to upset the mixture into the vat. For vats of larger size, refrigerating machinery or the circulation of cold water through a coil immersed in the vat are indicated; the first is costly and only found in large well-found cellars, but the second can be managed at a reasonable cost by those who have a supply of cold water on the premises. The coil should not be of piping too large in diameter, otherwise a large part of the water will escape without doing its work. The smaller the piping, the greater the cooling surface exposed to the must, but, of course, more piping will be required than that of large diameter. The water can be sent through by gravitation or by pumping. It must not be sent through too quickly, or it will not do its work. Do not put the coil at the bottom of the vat, but as near the surface as possible; the husks which have risen to the surface and have formed the "cap" always constitute the hottest part of the fermenting mass. When large quantities of must have to be fermented, and small vats would take up too much room, slate tanks and cement-lined concrete tanks do excellent service, as the heat generated by the fermentation in them is carried off so quickly that the temperature seldom rises to a dangerous point.

VATTING.

When fermenting on the husks, avoid filling the vat too full; a space of 8 to 12 inches should be left between the "cap" and the top of the vat. The object of this is to prevent access of air to the husks which are forced up by the escaping gas out of the must, and which would promptly begin to acetify. The space between the "cap" and the top of the vat is filled by carbonic acid gas; and if a wooden cover is placed on the vat, it will prevent this stratum of gas being displaced by currents of air. Under any circumstances, the "cap" should be frequently submerged to prevent acetification of the husks as well as to give as much colour as possible to the wine.

But the best system by far for obtaining these results is that of the submerged "cap," which is now being largely adopted, and can be managed at a small cost. At 6 or 8 inches below the edge of the fermenting vat, if a small one (more if it is of large size), four stout wooden buttons are screwed on to the inner side at equal distances. The screws must be strong enough to stand a considerable pressure, and the buttons must be of hard wood, 4 or 5 inches by 2 inches, and just loose enough to turn. Now make a stout head to the vat rather smaller in circumference, so that it will slip in and out easily, and on its edge cut four equidistant notches corresponding in width and position to the four buttons, which when turned will prevent it returning; if the vat is a large one, it can be made in two pieces, but must be provided with stout fastenings to hold it together. The head must be drilled pretty freely with the centre bit to allow the escape of the gas and must. Having filled the vat up to just below the buttons with the crushed grapes, slip the head over the buttons, and give them a half-turn to shut it down. As soon as fermentation begins, and the mass begins to swell in bulk, the head will keep back the husks and stalks, but allow the must as well as the carbonic acid to pass through the holes; the head will be covered with must, and the "cap" kept entirely out of contact with the air. In this way no acetification of the "cap" can possibly take place, as the *Mycoderma* find no resting place for their operations, and the wine extracts from the husks the utmost amount of colour. As the fermenting mass will cause considerable pressure on the head, care must be taken to drill enough holes to favour the escape of gas, and to put strong screws or bolts to the buttons.

DURATION OF VATTING.

It is worse than useless to allow the vatting to continue after the required colour has been extracted from the skins, as every hour that passes increases the danger of acetification of the "cap" when exposed to the air. A short vatting gives a lighter-coloured wine, but of more *finesse* and of quicker maturing quality.

A longer vatting gives a darker, harsher, and longer maturing wine.

When all the colour has been extracted from the skins (which can easily be ascertained by drawing a sample from the middle of the vat, either by spigot or syphon, at intervals of a few hours, and noting if the wine is darker), it should be racked off to finish its fermentation in the cask. Many vignerons continue the vatting until the saccharometer marks zero, but why they do so is a mystery. Once the wine has extracted all the colour from the husks, or all that is required, what is gained by continuing the vatting? If it is with the idea that the wine will not finish its fermentation without the husks, in that case there would be no dry white wines. Yet we see that must, run straight from the mill into the casks without vatting, ferments out all its sugar without difficulty. It is simply a custom, and a mistaken custom. Nothing is gained by it; in fact, there is loss of alcohol and increase of volatile acids in the wine.

PRESSING THE MARC.

As soon as the wine has acquired sufficient colour it should be run off into casks from the tap-hole of the vat, and the marc put in the press without delay, as acetification is very quick to commence. The wine running from the press is very dark, and is frequently put to ferment by itself in a cask instead of being mixed with the other. The reason for doing so is—that should the "cap" have been at all sour or infected with germs of disease, the whole of the wine will not be contaminated if it is kept separate. When the fermentation has quite ceased and the wine is clear, it will be seen if the press wine is sound, and if so it can then be mixed with the vat wine to give it more colour.

VATTING WITH THE STALKS.

If the husks of the vintaged grapes contain a sufficiency of tannin for the requirements of the future wine, it is better to avoid fermenting the stalks with the must; first, because it may communicate a stalky taste or too much astringency to the wine, and, secondly, because the greater the bulk of the "cap" the higher will be the temperature of the fermenting mass. Where no machinery is available, the stalks should be picked out by hand after the bunches are run through the crusher; but a simple and cheap appliance for removing stalks can be made at home. It consists of a wooden frame, 3 feet square, or larger if required, and 8 inches deep. All round one side are fixed large-headed nails, 1 inch or 1½ inches long, and 1 inch apart. A netting is now made of stout string or wire by weaving it across and across round the nails, which are then driven home to keep all tight. This frame is placed over a tub or convenient receptacle, and the grapes thrown on it and the bunches rubbed over the netting, and in a few seconds the grapes will all fall through leaving the stalks behind.

WHITE WINE.

As most white wine is made without fermenting on the husks, the procedure is simpler, and the danger of accidents less, than is the case for red wine. Should the must be fermented with the husks, it must remain in contact with them but a short time, just sufficient for the cap to rise; otherwise the wine, although light-coloured at first, will, with age, acquire a brownness requiring a considerable amount of fining to get rid of. If the juice is run straight into the cask, it is advisable to run the grapes unstalked through the crusher to impart to the must some of the tannin the stalks are rich in, as many white grapes are deficient in this substance; and a white wine, weak in tannic acid, clears with difficulty, and is liable to subsequent troubles.

Botany.

CONTRIBUTIONS TO THE QUEENSLAND FLORA.

By F. MANSON BAILEY, F.L.S.,
Colonial Botanist.

Order LEGUMINOSÆ.

ACACIA, Wild.

A. Chisholmi, *Bail.* (n. sp.) Plant very resinous, branches slightly pubescent, and more or less corrugated. Phyllodia linear about 1 in. long and scarcely exceeding ½-line broad, apiculate, often somewhat falcate, slightly hairy. Spikes erect, rather slender, about 4 or 5 lines long, upon a slender peduncle of an equal length. Flowers crowded, 5-merous. Sepals small, hyaline, only connate near the base. Petals twice as long as the sepals, free almost to the base, colour a deep-yellow. Stamens numerous; filaments flexuose, slender. Ovary scaly, style flexuose, exceeding the stamens. Pod linear, slightly curved, about 2½ in. long and 3 lines broad, tapering at the base to a stipes of 3 lines, margins thick, apex obtuse, veins anastomosing longitudinally, but often more or less hidden by the copious flow of resinous gum. Seeds obliquely transverse, oval, the central depression rather deep, nearly annular and minutely tubercular; funicle with 2 or 3 folds, thickened under the seed into an irregular cup-shaped aril. This species closely approaches *A. linarioides*, Benth.

Hab.: Prairie, Torrens Creek, Northern Railway Line, *Mr. W. R. Chisholm.* The specimens of this new species were kindly handed over to me for describing by Mr. J. H. Maiden, the Government Botanist of New South Wales, on account of the plant belonging to Queensland.

Order AMARYLLIDEÆ.

CRINUM, Linn.

C. brisbanicum, *Bail.* (n. sp.) Bulb about 1½ in. diameter, not produced into a collum. Leaves 5 or 6 to each plant, linear, substance rather thick, the margins very slightly rough, about 18 in. long and about ½-in. broad, of a deep bright-green. Scape about 16 in. high, compressed-cylindric, scarcely exceeding ½-in. diameter at the base. Flowers in umbel about 10, the 2 large involucral bracts 2 or 3 in. long, the interior ones (bracteoles) thread-like. Pedicels about 6 or 7 lines, ovary 3 lines long. Perianth-tubes slender, greenish, 3 in. long. Segments lanceolate, 2¼ in. long, ½-in. broad, white, with more or less greenish subulate points, those on the outer segments the longest. Stamens about half the length of the segments, those opposite the outer segments shorter than the other three; filaments deep-pink. Anthers 2½ in. long. Style coloured like the filaments and shortly exceeding them. Buds pinkish outside and pendulous before opening. Flowers fragrant, erect.

Hab.: Sandy land near the coast, Brisbane River.

C. pedunculatum, *R. Br.* Stems several to a plant, thick, often 5 or 6 in. diameter, from 1 to over 2 ft. high, leafy in the upper half. Leaves usually about 15 to a stem, glaucous, thick, 3 or 4 ft. long, and over 4 in. broad above the centre, and slightly tapering to somewhat obtuse points; the longitudinal

nerves and cross veinlets prominent; margins smooth. Peduncles usually from the axils of the lower leaves, often exceeding 2 ft. in length, compressed, $1\frac{1}{2}$ in. broad near the base, 1 in. broad at the top. Involucral bracts of firm consistence, 4 in. long, $1\frac{1}{2}$ in. or more broad at the base, tapering to blunt points; the thread-like bractioles about 3 in. long, and 1 line broad, flat, and white. Flowers in umbel about 24. Pedicels $1\frac{1}{4}$ in. long, the ovary $\frac{1}{2}$-in. long. Perianth-tube erect, green, angular, rather slender, $3\frac{1}{2}$ to 4 in. long; segments linear, white, $2\frac{1}{2}$ in. long, 4 or 5 lines broad; filaments spreading, about three-quarters of the length of the segments, purplish in the upper half; anthers narrow-linear, 6 or 7 lines long, pollen yellow. Style erect, one-half to three-quarters or slightly exceeding the length of the filaments, purple, or, when long, white towards the base. Stigma minutely lobed. Capsules 1 to 2 in. in diameter, irregularly globose, on stout pedicels from 1 to $1\frac{1}{2}$ in. long, the terminal beak prominent, 4 or 5 lines long. Seeds 9, angular, immersed in the placenta, varying much in shape and size.

Hab.: Creeks off Brisbane River.

As there exists considerable confusion in the nomenclature of the Australian species of this genus, I deem it necessary to publish fresh descriptions, drawn up from living plants of the Queensland species, as opportunities offer. Two such have already appeared in this *Journal*—viz., *C. brevistylum* and *C. pestilentis.*

CONTRIBUTIONS TO THE FLORA OF NEW GUINEA.

By F. MANSON BAILEY, F.L.S.,
Colonial Botanist.

Order ORCHIDEÆ.

DENDROBIUM, Swartz.

D. Armitiæ, *Bail* (n. s.p.) Stems very numerous, arising from a dense mass of aerial roots, very slender, scarcely exceeding 1 line diameter and 12 to 18 in. high; the old ones more or less clothed with the torn sheaths of old leaves, so much so at times that the nodes appear as if surrounded with a ring of stiff hairs. Leaves linear-lanceolate, 2 to $3\frac{1}{2}$ in. long, and scarcely 3 lines broad, tapering to a very oblique apex, numerous on the young stems and above the flowers on the flowering ones. Flowers numerous, lateral, light-pink, except the lateral lobes of the labellum, in pairs, the common peduncle very short or wanting. Pedicels including ovary 3 lines long, white; the ovary yellowish, very short. Sepals linear-lanceolate, about 4 lines long; the spur rather long, turned upwards. Petals long as the sepals, but rather narrower. Labellum shorter than the other segments, loosely attached to the elongated base of the column, 3-lobed, terminal, narrow, acuminate, very light-pink, recurved; the calli on the face being long and dense, the part might be termed "bearded"; lateral-lobes rather long, very dark-brown, incurved, truncate at the end, somewhat tapering at the base, margins entire. Disk white on each side of a thick raised dark-yellow midrib, along the sides of which are distant thread-like calli. Column very short, with broad lateral wings ending in a tooth at the top, white, except the face of the elongated part, which is orange-yellow. Anther-lid white. Pollen-masses amber-coloured.

Hab.: Near Samarai, New Guinea, *Miss Armit.* The plants brought from whence now (November) flowering in my son's bush-house at Toowong, and in the Glasshouse, Brisbane Botanic Gardens.

Plate LXXIX.

STACHYS ARVENSIS.

PLANTS REPUTED POISONOUS TO STOCK.

By F. MANSON BAILEY, F.L.S.,
Colonial Botanist.

HEDGE NETTLE (*Stachys arvensis*, Linn.).

This little English weed, called the Common Hedge Nettle, has been introduced into the cultivation fields and is now a pest in lucerne and other paddocks, and especially in badly cultivated lands. It is from a few inches to over 1 foot high, and produces many stems from the base. The whole plant is hairy; the leaves heart-shaped, obtuse, and bluntly toothed. Flowers small, pale-purple, from 2 to 6 in a whorl forming a loose leafy spike. Calyx of 5 nearly equal teeth. Corolla scarcely exceeding the calyx, the upper lip erect, entire, the lip spreading and of three lobes. Stamens 4, in pairs, ascending under the upper lip.

It must strike one as rather remarkable that this little European weed, so common on sandy or chalky lands in England, should be suspected in Queensland, where it has been introduced in course of cultivation and become naturalised, of causing such direful effect on stock in this colony, and is the more unaccountable when it is remembered that of the nearly 3,000 plants of the order to which it belongs, none are known to possess secretions of a deleterious nature. In Queensland this plant is reported to affect horses much in the same way as vertigo or "staggers." Mr. J. Ivory, amongst others, supplies symptoms produced by it in the horse. After eating it the effect is best seen when the horse is at work. "All at once it stops, shivers all over, and, if not allowed to spell a considerable time, is almost sure to die. Cattle if only browsing and let alone are not affected by it. Bullocks, when working, very frequently die through the bad effects of the plant. Even if they do not die, they cannot work above two hours a day. When opened after death the stomachs have the appearance of having been burnt with strong acid."

Quantities of this weed are often brought into town mixed with the lucerne sold for greenstuff, and according to report has caused the deaths of a number of working horses.

When it is known that horses or bullocks have eaten this herb, they should be unyoked and allowed to remain quiet for a few days; if continued to be worked, in all probability they would die.

Popular Botany.

PLANT-HELPING INSECTS.

AN ILLUSTRATION.

By PHILIP MAC MAHON, Curator.

On the opposite page will be seen an illustration (copied from the "Botanical Magazine") of a plant which shows a very remarkable instance of the manner in which one section of the organic world is made to minister to the necessities of another.

It is easy to imagine that, if all the fodder plants upon the earth were at one stroke swept out of existence, all the vast tribes of animals which live upon them would soon perish, and following these the carnivora, and finally in a great measure, if not absolutely, Man; but it is much more difficult to believe that the total extinction of a particular race of insects would inevitably be followed by the complete annihilation, as a matter of course, of whole families of plants.

And this is not merely a matter, as it is too often considered, for the speculation of the curious. The cross-fertilisation of plants effected by insect agency is so necessary for the continuance of the vigour of any given species that Nature has exhausted her every resource and displayed her deepest

cunning to bring about the desired result. Sometimes she says to the greedy insect: "See, here, in the nectary of this flower is honey. Enter in and take thy fill," and as the insect enters he pushes against a lever, and the anthers descend, placing upon him a load of pollen which he deposits on the stigma of the next flower he visits. This may be seen in several labiate flowers—those of the order to which the coleus belongs. Sometimes the pollen-bearers are very sensitive, and when touched by the trunk of the insect they spring suddenly forward like the steel jaws of a rat-trap when the bait is touched. The trunk of the insect is clasped by them, and as he withdraws it some of the precious pollen adheres to it, and is carried to another flower. You may see this for yourself by touching the bases of the petals of the Berberry with a fine blade of grass.

But these, you object, are isolated cases, and have no practical bearing. There are no isolated cases in Nature. She moves, as she has ever moved, in her grand, unchanging, resistless way, and whatever new facts men may discover about her can be referred to one of her changeless laws, some of which are dimly understood, and of some of which we are doubtless ignorant—

The very law which moulds a tear
  And bids it trickle from its source:
That law preserves the earth a sphere,
  And guides the planets in their course.

And the farmer, gardener, and orchardist can study with much advantage the lessons taught in the efforts of Nature to preserve the virility of her types. In the tea-growing districts of Assam it was found necessary to establish seed nurseries far away in the jungle, where there was no liability of insects carrying pollen of inferior types to vitiate the expected seed. In England recently a certain noble lord went in for fruitgrowing on a large scale, but it was found that, though there was an abundant show of healthy-looking flowers, the resulting fruit crop was very meagre. Someone suggested that perhaps owing to there being no bees in the neighbourhood the fruit had not set. A number of hives of bees were at once introduced, and that season the fruit followed the flower in equal abundance.

The plant above referred to is an orchid. It was sent from New Guinea by Sir William MacGregor, and flowered in these Gardens in 1886, and again this year. Its name is *Cirrhopetalum robustum.* It is a veritable fly-trap, built on a principle which seems to suggest human ingenuity. Discarding all scientific terms, it may be said that the flower consists of two leaflets joined near their points, but having an opening above, which is filled by a liver-coloured organ delicately poised on a slender stalk, like one of those ancient rocking stones which are sometimes seen in Scotland and Ireland. Behind this, and a little distance from it, there is a little pillar standing, and this has two flanges, one on either side, each terminated by a little horn at the top. On top of this pillar is a tiny cap, which you can remove with a stiff straw, and beneath this are the pollen-masses.

If you ever smell this orchid you will never desire another whiff of the same perfume. It is suggestive of animals whose funerals have been neglected. It sometimes scents the whole house.

Now look at the drawing. To the left, near the top, you will see a profile drawing of the organs of the flower with the outer leaves stripped off. A we will call the "balance," B the "pillar," and C the "pollen-cap." (We are inventing terms, but what we want is to understand the thing.)

The little tragedy we are going to witness has been seen here with great interest by many persons. As soon as this plant begins to send its peculiar odour through the air, quite a number of blue-bottle flies collect in the house, and quickly find the plant. A blue-bottle alights on the platform made by the yellowish outer leaves, and walks up to the balance. "Here is the very place," says she, "to deposit my eggs." She steps gingerly on at the point, and walks slowly up in the direction of the arrow in the drawing. But the moment she makes a step beyond the centre of gravity, the balance tips up,

Plate LXXX.

CIRRHOPETALUM ROBUSTUM

as you would tip a dray, and down goes Mrs. Blue-bottle head first, her wings jammed close against the pillar between the two flanges, and her back just touching the edge of the pollen-cap, a front view of which may be seen to the right of the illustration near the top.

Then begins a struggle. If she is a small weak fly, as many here are, she never escapes at all, but perishes miserably, and is quickly devoured by the small ants, and the wings sticking against the concave sticky face of the pillar show that many such tragedies have occurred, as is also shown by the presence of the dead flies.

But this is not what the orchid wants. It has no use for dead blue-bottles. It wants them as slaves, but not as provender. But, see, here comes a large strong fly; she alights on the platform, walks up to the balance, and is tipped down the cavity. But she will not perish without a fight. Step by step she works back, forcing herself against the pillar, and wriggling furiously. She catches the edge of the pollen-cap, forces it off; in a moment the pollen-masses, fresh and sticky, are fastened to her back; one supreme effort, and she is free and off with a glad buzz.

But, sad to reflect, she has learnt nothing from the deception and narrow escape. In a moment she is back again, gingerly mounting another balance, which as surely tips up and jams the pollen-masses against the stigmatic surface of the flower, where they remain. The most skilful hybridiser with his camel-hair brush could not have done it better. Then the struggle begins all over again, and the fly takes away another load of pollen, but leaves that which she brought from the former flower.

It will be noticed on looking at the drawing that one flower-leaf stands above the balance, as we have called it; and on looking at the lower flowers, it will be seen that this leaf is closed down in some of them, like a lid. This lid is always closed before the pollen is ripe enough to be carried away; and when the pollen-masses have been deposited on the stigmatic surface, the lid again closes down, and remains so closed until the seed-vessel is formed and the flower withers: the presence of insects is no longer desired.

We spoke of the intolerable odour of the living flower. Strange to say, the withered flower has a delicate perfume, exactly like that of new-mown hay.

Tropical Industries.

SUGAR-CANE.

In order to attain a luxurious growth, sugar-cane must be cultivated in a moist, warm climate, with short intervals of hot, dry weather, tempered by refreshing salt-breezes. Long periods of dry weather, and even passing spells of cold, are hindrances to successful growth.

The soil should be calcareous, rich in humus, and somewhat loamy. Medium, easily worked soils are preferable to heavy, clay soils, and also to light, dry, sandy soils. A deep soil, with ready facilities for irrigation, is desirable.

Sour soils, containing too much humus, may produce a vigorous growth of cane, the juice of which, however, contains but little sugar, and is difficult to convert. An examination of the soil is, therefore, of the utmost importance; it should include the determination not only of the most essential plant-food ingredients contained, but also of the injurious constituents. When certain salts, occurring in sea-water, are present in small quantities, they promote the growth of cane, without, however, exercising any beneficial influence upon the formation of sugar; when present in large quantities, these salts may prevent growth entirely.

Dr. H. Winter* analysed two soils in Java, to determine their lack of fertility with respect to sugar-cane, with the following results:—

1. 100 parts air-dried soil contained—

	Fertile Soil.	Unfertile Soil.
Water ...	5·47	6·07
Organic matter (loss after ignition)...	3·72	5·73
Nitrogen	0·05	0·06
Insoluble in hydrochloric acid	79·52	77·64

The soluble portion, calculated to 100 parts dry soil (at 150 degrees C.), contains:—

	Fertile Soil.	Unfertile Soil.
Silicic acid, aluminia, and oxide of iron	6·45	7·30
Lime	2·62	2·85
Magnesia	0·47	0·64
Potash	0·32	0·26
Phosphoric acid	0·52	0·42
Carbon dioxide	1·31	1·19
Sulphuric acid	0·03	0·11
Chlorine	*0·002*	*0·13*

0·13 per cent. chlorine corresponds to 0·21 per cent. chloride of sodium, which is very high, because a soil analysing over 0·1 per cent. chloride of sodium is considered unfertile.

2. The second analysis concerned subsoil water with a higher percentage of chlorine, which also occasioned an inferior growth of sugar-cane, as can be seen from the comparison of two different waters—

100,000 parts subsoil water from fertile field contained 72·75 parts chlorine
100,000 „ „ „ „ unfertile „ „ 336·50 „ „

A portion of the chlorine is absorbed by the plant, and acts injuriously upon the formation of sugar; as a consequence, the cane grown in the salty underground water contained but 9·8 per cent. sugar, only 76·4 per cent. of the juice being pure.

The ash of this cane contained a very high percentage of chlorine. According to the examinations of Professor Stutzer, of Bonn,† diseased, in comparison with healthy cane, analysed as follows:—

One hundred parts of dried cane at 100 degrees C. contained—

	Healthy Cane.	Diseased Cane.
Silicic acid	0·950	0·013
Lime ...	0·040	0·17
Magnesia	0·063	0·12
Potash ...	0·990	1·63
Soda ...	0·690	0·06
Phosphoric acid	0·269	0·49
Sulphuric acid ...	0·154	0·36
Chlorine	*0·150*	*0·54*

The minimum quantities of various plant-food ingredients essential for a good sugar-cane soil have, with the exception of lime, not as yet been determined. Semmler‡ states that the soil should contain at least 1 per cent. of the latter constituent. Nitrogen, phosphoric acid, and potash should be applied artificially in almost every case, as the supply of these ingredients in the soil soon becomes insufficient for the needs of the crop. Sugar-cane requires a considerable amount of the essential plant-food ingredients, as shown by the detailed investigations of Mr. C. J. van Lookeren, of Campagne Klatten.§ This gentleman found that a crop of cane removed from one acre:—

* Archief voor de Java-Suikerindustrie, 1894, I., pag. 129
† Landw. Versuchsstationen, 1892, p. 325.
‡ Semmler, "Die tropische Agricultur" III., p. 224.
§ Archief voor de Java-Suikerindustrie, 1893, p. 397.

	Nitrogen.	Potash.	Phosphoric Acid.	Lime.
78,701 lb. cane ready for grinding ...	40·9	85·0	40·1	16·5
54,305 ,, tips and green leaves ...	10·5	33·5	5·0	4·9
9,523 ,, dry leaves	23·9	52·6	7·8	50 6
Total	75·3	171·1	52·9	72·0

It is evident that even the best soils will become depleted in the course of time, and they must, of course, be replenished, in order to produce profitable crops. The continued planting of sugar-cane exhausts the soil very rapidly, causing first a deficiency of nitrogen, then of phosphoric acid, and lastly of potash. The application of stable manure and artificial fertilisers is, therefore, rendered indispensable. Unfortunately, ready mixtures are generally applied to this plant, so that only by conducting exhaustive experiments can we obtain definite results regarding the beneficial effects of the single ingredients. A few trials have been inaugurated, it is true, but no fixed conclusions can be drawn from them.

The following three tables, illustrating the results of the latest experiments conducted in Java, were recently prepared by Mr. W. Eicke, Mestfabriek, Samarang :—

FERTILISER EXPERIMENT ON SUGAR-CANE IN JAVA.

No. of Plot.	Fertilisers Applied per Acre in lb.	Weight of Cane from 1 Acre.	Sugar obtained from 1 Acre at 75 per cent. Pressure.	Analysis of Juice at Medium Pressure of 73·6 per cent. Brix.	Sugar.	Purity.	Glucose.
		lb.	lb.	p. cent.	p. cent.	p. cent.	p. cent.
1	No fertiliser	41,082	5,037	21·5	19·04	88·6	0·40
2	" "	42,971	5,037	20·3	18·01	88·7	0·33
3	393 lb. guano and 236 lb. sulphate of potash	54,619	6,611	21·4	18·68	87·3	0·48
4	236 ,, bone-meal and 178 lb. sulphate of ammonia	55,563	6,532	20·9	18·29	87·5	0·40
5	393 ,, guano (10 per cent. phosphoric acid, 7 per cent. nitrogen, 4 per cent. potash)	56,586	6,847	20·6	18·35	89·1	0·27
6	236 ,, earth-nut cakes and 236 lb. nitrate of soda	71,303	8,657	20·6	18·38	89·2	0·27
7	393 ,, guano and 78 lb. sulphate of ammonia and 156 sulphate of potash	78,150	9,208	21·1	18·40	87·2	0·57
8	786 ,, earth-nut cakes (5½ per cent. nitrogen)	93,340	10,073	19·1	16·74	87·6	0·42
9	1,180 ,, earth-nut cakes and 236 lb sulphate of potash (50 per cent.) ...	101,996	10,861	19·3	16·73	86·7	0·57
10	1,180 ,, earth-nut cakes and 315 lb. sulphate of potash	110,103	11,097	19·0	16·23	85·4	0·57
11	1,180 ,, earth-nut cakes and 393 lb. acid phosphate (30 per cent.) ...	97,668	11,333	20·8	18·19	87·5	0·48
12	1,180 ,, earth-nut cakes and 236 lb. bone meal (25·4 per cent.)	104,909	11,411	20·5	17·51	85·4	0·67
13	1,180 ,, earth-nut cakes and 156 lb. sulphate of potash	113,644	11,491	19 0	16·23	85·4	0·52
14	1,180 ,, earth-nut cakes and 315 lb. acid phosphate	106,473	11,648	19·4	17·02	87·7	0·36
15	1,180 ,, earth-nut cakes and 472 lb. acid phosphate	110,968	11,963	19·6	16·99	86·7	0·66
16	1,180 ,, earth-nut cakes and 393 lb. sulphate of potash	114,038	12,041	19·4	16·76	86·4	0·51
17	1,574 ,, earth-nut cakes	125,056	12,277	18·3	15·69	85·7	0·63
18	1,180 ,, ,, ,, ...	114,667	12,592	19·6	17·13	87·4	0·45
19	1,180 ,, ,, ,, and 393 lb. plaster	119,075	12,670	19·7	16·97	86·1	0·55
20	1,180 ,, earth-nut cakes and 393 lb. acid phosphate and 236 lb. sulphate of potash	118,603	12,986	19·6	17·07	87·1	0·47

The above figures indicate that—

1. The yield of cane increases in proportion to the amount of nitrogen.

2. The application of potash and phosphoric acid, together with large quantities of earth-nut cakes, did not produce a further increase in the yield; however, where the amount of nitrogen was smaller, an increase resulted.

3. The beneficial effect of earth-nut cakes is to be ascribed not only to the nitrogen they contain, but also to the potash and phosphoric acid, as 1,180 lb. of earth-nut cakes contain 18 lb. of potash and 15 lb. of phosphoric acid.

4. The addition of potash and phosphoric acid to earth-nut cakes produced a decidedly beneficial effect in the formation of sugar, and caused the highest yield of sugar (Plot 20).

No. of Plot.	Fertilisers Applied per Acre in lb.	Weight of Cane from 1 Acre.	Sugar obtained from 1 Acre at 75 per cent. Pressure.	Analysis of Juice at Medium Pressure of 73·6 per cent.			
				Brix.	Sugar.	Purity.	Glucose.
		lb.	lb.	Per cent.	Per cent.	Per cent.	Per cent.
1	236 lb. sulphate of ammonia ...	73,743	6,060	18·8	14·88	79·1	1·73
2	236 ,, sulphate of ammonia ... 31·5 ,, acid phosphate (20 per cent.) ... ... 35·4 ,, sulphate of potash (96 per cent.) ... ... 11·8 ,, sulphate of magnesia (70 per cent.)	72,799	7,201	19·3	16·24	84·1	1·04
1A	236 lb. sulphate of ammonia ...	83,738	7,870	19·4	15·98	82·3	1·35
2A	236 ,, sulphate of ammonia ... 31·5 ,, acid phosphate (20 per cent.) ... ... 35·4 ,, sulphate of potash (96 per cent.) ... ... 11·8 ,, sulphate of magnesia (70 per cent.)	91,451	9,680	19·6	16·88	86·1	0·96

These figures indicate that, while the addition of potash and phosphoric acid scarcely increased the yield of cane, the beneficial effect upon the formation of sugar was so marked, as to cause a large excess of sugar over the quantities obtained from the plots fertilised with nitrogen alone.

Additional results have been obtained from experiments carried out in British Guiana* and collected in the following table:—

No. of Plot.	Fertilisers Applied per Acre in lb.		Percentage of Increase over Unfertilised Plot.	
			With 11,150 lb. Slacked Lime per Acre.	Without Lime.
			Per cent.	Per cent.
1	No fertiliser		..	...
2	44,600 lb. stable-manure		+ 14·8	+ 21·4
3	44,600 ,, stable-manure; 245 ,, sulphate of ammonia	... ...	+ 19·6	+ 24·5
4	89 ,, sulphate of potash; 455 ,, acid phosphate	... ...	+ 13·7	+ 4·5
5	245 ,, sulphate of ammonia		+ 17·5	+ 18·0
6	303 ,, nitrate of soda		+ 22·9	+ 20·8
7	245 ,, sulphate of ammonia	+ 89 lb. sulphate of potash and 455 lb. acid phosphate on each of these plots	+ 18·0	+ 20·0
8	303 ,, nitrate of soda		+ 18·1	+ 19·8
9	366 ,, sulphate of ammonia		+ 21·5	+ 25·8
10	455 ,, nitrate of soda		+ 18·2	+ 21·5
11	491 ,, sulphate of ammonia		+ 22·7	+ 30·5
12	607 ,, nitrate of soda		+ 15·3	+ 20·8

Unfortunately, no exact analyses of the juice were made in this instance. The experiment shows that the application of very large quantities of stable-manure produces an increase in the yield of cane, though this increase is not

* "Sugar Cane," 1894, p. 505.

larger than that produced by an average application of nitrogen in the form of nitrate of soda or sulphate of ammonia. On the other hand, the juice from cane fertilised with stable-manure did not contain much sugar, and was not well compounded. Potash and phosphoric acid alone produced but a small increase over the unfertilised and unlimed plot, while on the limed plot there was a larger increase, probably on account of the tendency of lime to promote the formation of nitrate.

As nitrogen alone produced a considerable increase, the effect of the addition of potash and phosphoric acid was not very apparent; perhaps the application of a larger quantity of potash might have given better results. In the majority of cases, nitrogen in the form of sulphate of ammonia produced a more beneficial effect than the same amount of that ingredient in the form of nitrate of soda; while the application of larger quantities of nitrogen in the form of sulphate of ammonia increased the yield, this was not the case when nitrogen was applied in larger quantities in the form of nitrate of soda.

Phosphoric acid in the form of ground phosphates was not applied in this experiment, although by the application of 303 lb. of acid phosphate the yield was increased 5 per cent., while an increase of 10 per cent. resulted from an application of from 455 to 607 lb.

Lime was of great benefit on this soil, the yield of cane being increased by its application 15 per cent.: from 23·610 lb. to 27·152 lb. (based on an average of 18·67 per cent. sugar). The plots upon which lime had not been applied showed in every instance a lower analysis of sugar in the juice of the canes.

Mr. J. D. Kobus, of Soerabaia,* inaugurated experiments in Java for the purpose of observing the effect on sugar-cane of large applications of nitrogen. These experiments extended over several years, and were conducted upon a light, gravelly soil, which requires a large amount of nitrogen.

FERTILISER EXPERIMENT ON SUGAR-CANE UPON A LIGHT SOIL.
By J. D. Kobus, East Java Experiment Station (1892).

No. of Plot.	Fertilisers Applied per Acre in lb.	Dates of Harvesting.	Weight of Cane from 1 Acre.	Sugar obtained from 1 acre at 75 p.cent. Pressure.	Analysis of Juice			
					Brix.	Polarisation.	Glucose.	Purity.
			lb.	lb.	per cent.	per cent.	per cent.	per cent.
1	No fertiliser	June 2-3	69,519	6,758	17·4	15·67	0·65	90·1
2	157 lb. sulphate of ammonia	,, 3	93,817	9,083	17·5	15·63	0·69	89·6
3	315 lb. sulphate of ammonia	,, 10-11	108,004	10,209	16·9	15·21	0·64	89·5
4	472 lb. sulphate of ammonia	,, 11	125,763	11,300	17·3	15·26	0·65	88·5
5	197 lb. nitrate of soda ...	,, 14-15	92,575	9,626	17·8	16·34	0·47	91·8
6	393 lb. nitrate of soda ...	,, 19	104,298	9,976	18·3	15·96	0·73	87·4
7	590 lb. nitrate of soda ...	,, 12-13	116,447	10,675	16·7	14·88	0·62	89·1

In this trial the double, and also the triple applications of nitrogen produced a corresponding increase in the yield; the increase was larger in the case of sulphate of ammonia than in the case of nitrate of soda.

FERTILISER EXPERIMENT ON SUGAR-CANE UPON A GRAVELLY SOIL (TARRABAN).
By R. J. Bouricius, Ketegan Experiment Station, Java (1893).

No. of Plot.	Fertilisers Applied per Acre in lb.	Weight of Cane from 1 Acre.	Sugar obtained from 1 Acre at 75 per cent. Pressure.	Analysis of Juice under Pressure of 75 per cent.			
				Brix.	Sugar.	Purity.	Sugar obtained.
		lb.	lb.	per cent.	per cent.	per cent.	per cent.
1 & 8	No fertiliser	72,586	9,296	20·1	92·5	17·10	17·10
2 & 7	157 lb. sulphate of ammonia ...	81,901	11,314	19·8	92·7	16·96	16·96
3 & 6	315 ,, ,, ,, ,, ...	104,414	11,683	20·0	87·3	14·92	14·92
4 & 5	472 ,, ,, ,, ,, ...	107,520	11,683	18·0	90·3	14·50	14·50

These results, as well as those tabulated below, seem to agree with the results obtained in the previous year.

* "Archief vor de Java-Suikerindustrie," 1896, p. 101.

FERTILISER EXPERIMENT ON SUGAR-CANE UPON A PRETTY LIGHT SOIL.

By J. D. Kobus,* Madjoagoong Sugar Factory, Java.

No. of Plot.	Fertilisers Applied per Acre in lb.	Weight of Cane from 1 Acre.	Sugar obtained from 1 Acre at 75 per cent. Pressure.	Analysis of Juice.		
				Brix.	Sugar.	Purity.
		lb.	lb.	per cent.	per cent.	per cent.
1	No fertiliser	49,684	6,381	18·80	18·0	95·67
2	224 lb. sulphate of ammonia	74,915	8,423	17·95	16·46	91·70
3	449 ,, ,, ,, ,, ...	87,336	9,782	17·38	16·16	92·98
4	637 ,, ,, ,, ,, ...	97,816	9,580	16·30	14·65	90·0

* Archief voor de Java-Suikerindustrie, 1896, dag., 105.

A triple quantity of nitrogen produced a decrease in the contents of sugar in this, and also in the previous experiment. The largest quantity of sugar was obtained from the application of a double amount of nitrogen. An application of 673 lb. sulphate of ammonia per acre is excessive and seldom pays.

POHDJEDJER SUGAR FACTORY (LIGHT GRAVELLY SOIL WITH ROCKY SUBSOIL).

No. Plot.	Fertilisers Applied per Acre in lb.	Weight of Cane from 1 Acre.	Sugar obtained from 1 Acre at 75 per cent. Pressure.	Analysis of Juice.		
				Brix.	Sugar.	Purity.
		lb.	lb.	per cent.	per cent,	per cent.
1	No fertiliser	65,598	7,880	19·0	17·54	92·86
2	157 lb. sulphate of ammonia	88,345	9,813	18·6	16·66	89·79
3	315 ,, ,, ,, ,, ...	100,688	11,567	18·0	16·70	92·50
4	472 ,, ,, ,, ,, ...	89,043	11,427	19·7	18·32	93·25

The triple quantity of sulphate of ammonia upon this soil produced no increase in the yield of cane over the single quantity; the former did not, however, decrease the amount of sugar.

TJOEKIR SUGAR FACTORY (SANDY, GRAVELLY SOIL, WITH COMPACT SUBSOIL).

No. of Plot.	Fertilisers Applied per Acre in lb.	Weight of Cane from 1 Acre.	Sugar obtained from 1 Acre at 75 per cent. Pressure.	Analysis of Juice.		
				Brix.	Sugar.	Purity.
		lb.	lb.	per cent.	per cent.	per cent.
1	No fertiliser	126,151	12,732	17·73	15·59	87·93
2	157 lb. sulphate of ammonia	123,279	10,954	16·25	14·05	86·46
3	315 ,, ,, ,, ,, ...	121,648	10,923	16.70	14·35	85·93
4	472 ,, ,, ,, ,, ...	125,841	11,528	16·73	14·47	86·49
	KLOERAHAN SUGAR FACTORY (LOAMY, GRAVELLY SOIL).					
1	No fertiliser	94,633	8,105	16·6	14·14	85·18
2	157 lb. sulphate of ammonia	104,569	8,982	16·5	13·98	84·73
3	315 ,, ,, ,, ,, ...	106,898	8,586	16·1	13·71	85·15
4	472 ,, ,, ,, ,, ...	107,209	8,446	15 9	13·41	84·34

Both of these fields produced large yields, even on the unfertilised plots; they must have been rich in nitrogen, for the application even of larger quantities of that ingredient produced no beneficial results.

In these experiments, half of the plots were manured with 39 lb. double superphosphate (45 per cent.) per acre, in order to determine the effect of phosphoric acid upon the formation of sugar. It was found that the phosphoric acid neutralised the deleterious effect produced by the excessive

nitrogen-fertilisation, a fact with which most sugar-planters are probably familiar. The effect of phosphoric acid was especially noticeable in a field at Dinoyo, the yields per acre in this instance being :—

	Cane.	Sugar.
Without superphosphate ...	63,307 lb.	7,429 lb.
With " ...	89,353 "	9,409 "

Mr. H. Morrison,* Makaweli Plantation, Hawaii, makes the following report of a fertiliser experiment conducted in 1895 :—

Fertilisers Applied per Acre.	Yield of Sugar per Acre. lb. lb.
1. No fertiliser	8,956—10,075
2. 13,434 lb. stable-manure	13,434
3. 6,717 " stable-manure + 1,119 " artificial fertilisers { 10 per cent. phosphoric acid ... 5 per cent. nitrogen (ammonia)... 6 per cent. potash ... ... }	14,553—15,672
4. 1,119 " artificial fertilisers, same as Plot 3, without stable-manure	14,434
5. 8,956 " slaked lime	12,314
6. 1,119 " artificial fertilisers { 10 per cent. phosphoric acid ... 5 per cent. nitrogen (nitrate) ... }	13,434—14,553

The above figures speak for themselves, and furnish sufficient proof of the fact that a correctly proportioned artificial fertiliser has as beneficial an effect as the average applications of stable-manure.

Stable-manure in combination with artificial fertilisers gave the highest yield.

* The Hawaiian Planters' Monthly, 1896, p. 17.

QUEENSLAND NUTS.

By E. COWLEY,
Manager, State Nursery, Kamerunga.

Mr. E. Cowley proposes to furnish a series of short articles on some of our North Queensland nuts, and these notes will doubtless prove interesting to the readers of the *Journal.*

No. 1—THE CANDLE NUT.

The so-called "Queensland nut," *Macadamia ternifolia*, F. v. M., does not apparently extend to within the tropical portion of our colony, but belongs to the extra-tropical division. The same may be said of two other members of this family—viz., *M. Youngiana* (which is found at Maroochie, and reported to be poisonous), and *M. verticillata*, which is reported from the Pine River. These nuts belong to the natural order Proteacæ. Our own nuts belong to other tribes.

To begin with what is probably the best known of our North Queensland nuts, the candle nut (*Aleurites moluccana*, Willd., or *Aleurites triloba*, Forst.), belonging to the natural order Euphorbeaceæ. This tree grows to a large size, rising to 70 or more feet, with a diameter sometimes of 3 feet at the base, in our scrubs. It is a soft wood, but sawmillers often use it for cutting into boards for fruit-box-making, notwithstanding that it is rather heavy when it is sawn. It dries in a short time, and makes up into excellent fruit-boxes, having the great advantage of not splitting when nails are driven in near the ends. It seems a shame, however, to sacrifice such a valuable tree for fruit-cases;

but, nevertheless, it is done. This tree appears first to have been found in the Molucca Islands, Dutch East Indies; but it has a large range, extending from Ceylon to the Sandwich Islands, as well as to this country. Probably there are variations in its growth and habit; but the tree is the same. As has been already stated, it grows to a great height, is very conspicuous in the scrubs, the leaves having a silvery appearance when ruffled by the wind, as they are densely meally beneath. They are on long petioles or stalks, are large, entire, lobed; the fruit is large, separate, and discloses three roundish nuts, which are about 1 inch in diameter, having a hard shell.

These are candle nuts, and they remain sound on the ground for a long time. The preceding year's nuts may be collected at the time the fresh crop falls. The natives of North Queensland, whose name for them is "nabala," do not esteem the nuts as edible, and seldom eat them. It is not advisable for anyone to eat many, on account of their purgative and other properties, but one or two may be eaten by most persons, and relished, without bad effects. The oil contained in the kernel is used as a drying oil for paint, and is known as country walnut oil and artists' oil. In Ceylon it is called Kekune oil, and in the Sandwich Islands Kubul oil. The nut is said to be used by the Polynesians as a candle, a wick being placed in the centre for the purpose of ignition—hence, probably, the vernacular name, "candle nut." This is certainly not a nut for the table, but it is valuable on account of its oil. Being indigenous to our district, there is no reason why the nuts should not be collected and forwarded to market by those settlers who live near the scrubs. The tree is often planted in the more southern parts of this colony as an ornamental one, and it certainly forms a very effective shade for large gardens or lawns. It is not suited for exposed situations, nor is it, I believe, a long-lived tree, but it has a rapid growth, and this is often a desideratum. This tree is among the first to spring up after heavy scrub has been felled, and very often commands the situation afterwards. Candle nuts exist in many places where the primeval forest has been cleared and left to the renewing powers of *Aleurites*.

Tick Fever.

TECHNIQUE OF THE METHOD OF PREVENTIVE INOCULATION.

BY C. J. POUND, F.R.M.S.,
Director of Queensland Stock Institute.

NECESSARY APPLIANCES.

BY carefully considering the following directions, anyone accustomed to work among cattle may be able to perform the necessary operations without personal instructions. The operator must be provided with the following necessary appliances:—

1. Six feet of whipcord.
2. Trocar and canula. The latter should not be less than $\frac{1}{8}$-inch diameter.
3. Syringe to hold 10 c.c., fitted with about 3 inches of thick-walled rubber tubing, and one or two of the improved needles.
4. Two large wide-mouth jars or jugs, to hold about $1\frac{1}{2}$ pints each.
5. Two small wide-mouth bottles, to hold about 2 oz. each.
6. Twenty to thirty fowl-wing feathers, previously washed in strong carbolic solution, 1 in 20, then in clean water, and finally dried in the sun.

7. Several pieces of clean linen or calico.
8. Clinical thermometer.
9. *Note.*—For the inoculation of large herds of ordinary station or wild cattle in a crush, some additional appliances are found to be absolutely necessary. At first a by-way tap was used, but, in consequence of the possibility of so many errors occurring through the operator turning the tap the wrong way, this accessory has been superseded by a specially designed double-action valve made in two separate pieces. The larger part A, with two nozzles, is fitted on to the front of the syringe; to the upper or long nozzle is attached some 10 or 12 feet of thick-walled (small aperture) rubber tubing; at the other end of this tubing is fixed the inoculating needle. To the smaller or lower nozzle is attached about 30 inches of the same kind of tubing, the opposite end of which is fixed on to the smaller part B, which is placed in an upright position at the bottom of a small sodawater bottle, which is kept in the trousers-pocket of the operator in charge of the syringe.

METHOD OF PREPARING CALVES FOR THE SUPPLY OF IMMUNE BLOOD.

The overwhelming evidence, resulting from the most crucially conducted experiments, and the extensive practical experience of a large section of keen observant stockowners, prove beyond all doubt the efficacy of the method of preventive inoculation for Tick Fever as first initiated in the Mundoolun and Inkerman experiments of April, 1897. Although the actual method of drawing the blood and injecting the same into animals to be protected has not been improved upon, still, in addition to the various improvements in the inoculating instruments, there have also been several modifications in the method of rendering the blood of animals suitable for general inoculation purposes.

The number of calves required to supply blood naturally depends in a great measure on the size of the herd, or, in fact, the number of animals to be inoculated. Experience has shown that twelve yearling heifers will provide sufficient blood to inoculate a herd of 20,000 cattle; while it is recorded that 8,000, and even 10,000 cattle have all been efficiently inoculated with the blood from only four animals. For general inoculating purposes, the blood of an animal artificially inoculated is to be preferred to that from an animal recovered from natural Tick Fever, the mode of operation being as follows:—Procure the desired number of healthy yearling calves (heifers, if possible), and a supply of freshly drawn defibrinated blood from a naturally recovered animal. The best way of operating is to throw each calf on its left side; the legs may be either tied or held by an assistant; the head is covered with a bag, which makes the animal lie quieter than it otherwise would do. By means of the piece of whipcord which is placed round the base of the animal's neck with a running noose, the right jugular vein is compressed so that in a few minutes it becomes dilated or swollen by the blood coming from the animal's head. A very necessary precaution will be to flatten the hair on the skin covering the vein with a little solution of 1 in 20 carbolic acid; this removes any danger of introducing foreign matter which might produce blood-poisoning or an abscess under the skin. The calf is lying on the ground with its feet from the operator, who, standing behind, lays his left hand on the neck and gently holds the swollen vein in a steady position between the forefinger and thumb close up to the cord to prevent the vein from shifting laterally. He then takes the improved needle in his right hand, and steadily pierces the skin into the vein. If the vein has been pierced successfully, blood will spurt out. An assistant then hands the operator the syringe filled with 10 c.c. of the recovered tick-fever blood. The nozzle of the syringe is then immediately connected with the needle by means of a small piece of rubber tubing in such a manner that there is an uninterrupted column of blood from the vein to the end of the piston-rod of the syringe; for the

fact must not be overlooked that a small bubble of air injected into the bloodvessel may cause instant death of the animal. Directly the syringe is coupled with the needle the cord is removed from the neck, and the blood ejected from the syringe into the vein. It is advisable on withdrawing the needle to pinch the skin around the wound and apply a little more carbolic solution before releasing the animal. After each calf has been inoculated, they should be kept in a well-grassed paddock with plenty of fresh water, and their temperatures taken regularly night and morning from the eighth to the twenty-fourth day after inoculation. Those giving a very decided reaction—viz., temperature rising from the normal (101·5 degrees Fahrenheit) to 106 degrees Fahrenheit or higher—are, when they have completely recovered (which will be within six weeks), suitable subjects for drawing blood from for general inoculation purposes, and are generally spoken of as "immune calves." The reasons why young animals are preferred are:—(1) They are easily handled and managed. (2) The subcutaneous tissue of the neck between the jugular vein and the skin is not very thick. (3) In inoculating blood from a calf there is very little risk of introducing tuberculosis, which is seldom found in calves; however, in order to minimise any possible risk from this disease, the calves can be all previously tested with tuberculin.

METHOD OF DRAWING THE BLOOD FROM THE IMMUNE CALF AND PREPARING SAME FOR GENERAL INOCULATION PURPOSES.

The immune calf is thrown on its left side, and a cord tightened round the neck as previously described, but instead of a needle the operator takes the trocar (with canula attached) in his right hand, and with it in a vertical position steadily pierces the skin into the vein. Immediately the point is through the wall of the bloodvessel, the instrument is held in a slanting position and gently pressed further into the distended vein. The operator then withdraws the trocar with the right hand, the while holding the sheath or canula with his left, and keeping it well into the bloodvessel. If the vein has been successfully pierced, blood will flow copiously. If it does not flow, the operator returns the trocar into the sheath and gently withdraws both of them a very slight distance but not out of the wound, because at the first insertion the trocar may have been forced through the vein or on one side of it, which often happens in the case of young thick-necked bulls. However, as soon as the blood flows freely on withdrawal of the trocar it is caught in a perfectly clean wide-mouth bottle. From an animal six months old half-a-pint of blood may be taken, and as much as a pint and a-half from a yearling. In the summer time, when the flies are plentiful, a little tar should be placed on the wound before the calf is released. As soon as the requisite amount of blood is drawn, it should be well stirred for about five minutes with a whisk formed of half-a-dozen wing feathers from a duck or fowl. At the end of that time the whisk, when lifted out, will be found to be covered with stringy-like fibrinous blood-stained matter. This is the fibrin, and its removal prevents the blood thickening, clotting, or coagulating. The process of whisking and removing the fibrin is known as defibrination. Defibrinated blood is that which has been so treated. The blood is afterwards strained through a piece of clean linen or calico into another clean bottle, and is ready for use.

DETAILS OF THE PROCESS OF INOCULATION.

Allowing 5 c.c., which is equal to one teaspoonful, for one bullock, one pint of defibrinated blood would be adequate to inoculate about 100 cattle. To minimise, as far as possible, the risk of contamination, the following precaution may be adopted:—The operator puts about 2 ounces of blood from the stock bottle into a small wide-mouth bottle, which is covered with clean linen or calico. The small bottle is for actual work of inoculation, and should be filled up as required.

Inoculation should be performed without delay. Ordinary station cattle to be inoculated should be placed in a crush, and as many as possible at a time, so that the work may be carried on quickly. Dairy cattle may be secured in a bail; while young calves may be held against the rails in a stockyard. The syringe now comes into use, and a word or two of description here may be useful. It is in principle like a squirt or garden syringe, but should have the very latest improvements. The cylinder or barrel should be made of stout glass to hold 10 c.c. with metal protecting sides, on each of which are fixed either a metal ring or a projecting piece to enable the operator to inject the blood with one hand. The plunger on the piston-rod should be made of rubber. In the latest form of syringe there is a very ingenious device for tightening or slackening the rubber washer of the piston-rod without removing the latter from the cylinder. On the glass cylinder of some kinds and on the piston-rod of others (the latter preferred), there will be noticed a row of figures, each one above a transverse line. The space between each line indicated is 1 c.c. (cubic centimetre)—that is to say, when the piston rod has been withdrawn until the figure 4 is visible, there will be 4 cubic centimetres of space in the cylinder of the syringe. On the piston-rod of all modern syringes there is also a little set-screw which can be screwed up and down to any part of the rod; therefore, if the syringe is first filled with blood and the set-screw turned down to the figure 5, only 5 cubic centimetres of blood can be injected. The above description only refers to syringes having the figures 1 to 10 on the piston-rod reading from the handle to the rubber plunger. With each syringe there is usually supplied one or more hollow needles, each having a metal socket which fits on to the nozzle-point of the metal protector of the glass cylinder. As the animals shrink and move suddenly from the needle when thrust into them, it is very apt to get broken owing to its being rigidly attached to the syringe, and on account of its very thin wall with large aperture, which is liable to become clogged when passing through the skin; consequently another needle has been designed. The improved needle has a smaller aperture with thick wall, thus enabling the point to be sharpened on an oilstone like a lancet. The needle is fixed in a small metal handle with depressions on either side for the thumb and finger and a circular shield in front which enables the operator to have a firmer grasp. Instead of being fixed rigidly on the syringe, it is connected by means of about 2 inches of thick-walled indiarubber tube, one end of which fits on to the nozzle of the syringe, while the other is attached to the handle of the needle, thus giving free play to the syringe when blood is being injected into an animal, and the operator has more freedom in using it. The tubing should be three-eighths of an inch in diameter, and the walls so thick that the aperture is only one-sixteenth of an inch in diameter. Thick tubing does not kink and stop the flow of blood, even when turned at right angles. The instrument, having been made ready by fitting on the tube and needle, is filled with blood from the small bottle, and the set-screw fixed at the figure 5. As explained above, the inoculation of calves for subsequent supply of blood takes place direct into the jugular vein, but this process could not be carried out in inoculating cattle generally as a preventive against Tick Fever. However, the following is the method in use at the present time, and whereever adopted has given satisfactory results :—A little fold of loose skin behind the shoulder of the animal to be inoculated is lifted from the ribs with the left hand. The needle, with the flattened edge outward, is then plunged with a sudden thrust obliquely about an inch through the skin into the loose or subcutaneous tissue; thereafter the piston is pressed very slowly down, and the blood forced into the animal. Although practical experience has proved that behind the shoulder is the most favourable site for the inoculation, it may be accomplished, when necessity arises, in any other part of the body where the skin is loose. But animals should not be inoculated in the tail, the reasons being, in the first place, that the tail is exceedingly sensitive, and the needle is more apt to get broken in it than in any other portion of the body, and, in the

second place, that it is impossible to introduce the required amount of blood. The blood having been transferred from the syringe to the beast, the operation is complete. It is not necessary to take the temperatures of the animals afterwards, as if proper blood is used the inoculation seldom fails.

SPECIAL NOTES ON THE INSTRUMENTS AND THEIR USE.

THE TROCAR AND CANULA.

When using the trocar, special care should be exercised that the canula is not shifted forward beyond the little shoulder of the point of the trocar; otherwise the greatest difficulty will be experienced when endeavouring to insert the trocar into the vein.

It will be noticed that the trocar has three cutting edges at its point; therefore if it is thrust into the vein without using any screwing motion, it will push with it three little triangular flaps of the wall of the bloodvessel, which press against the outer sides of the canula; consequently, after having obtained the required amount of blood, the canula is withdrawn, and the three little flaps, being of an elastic nature, are immediately brought into their normal position, and act as valves, in consequence of the pressure of blood within the vein, thereby preventing the blood from escaping. In this method there is no tying or stitching of the skin, as is the case when the operation of bleeding is performed by means of the fleam, an instrument which has now become almost obsolete.

To facilitate the introduction of the trocar, the skin of the neck above the vein can be cut nearly through beforehand with a sharp knife.

THE HYPODERMIC SYRINGE.

The reason why a syringe holding 10 c.c. is recommended, when only half the quantity—viz., 5 c.c.—is a standard dose for each animal, is that frequently when filling the syringe a bubble of air gets inside. This does not matter in the least, for by making it a golden rule when inoculating to always hold the syringe in a slanting position, with the nozzle downwards, the exact quantity of blood only is injected, while the remaining blood *plus* the air-bubble are kept back in the syringe.

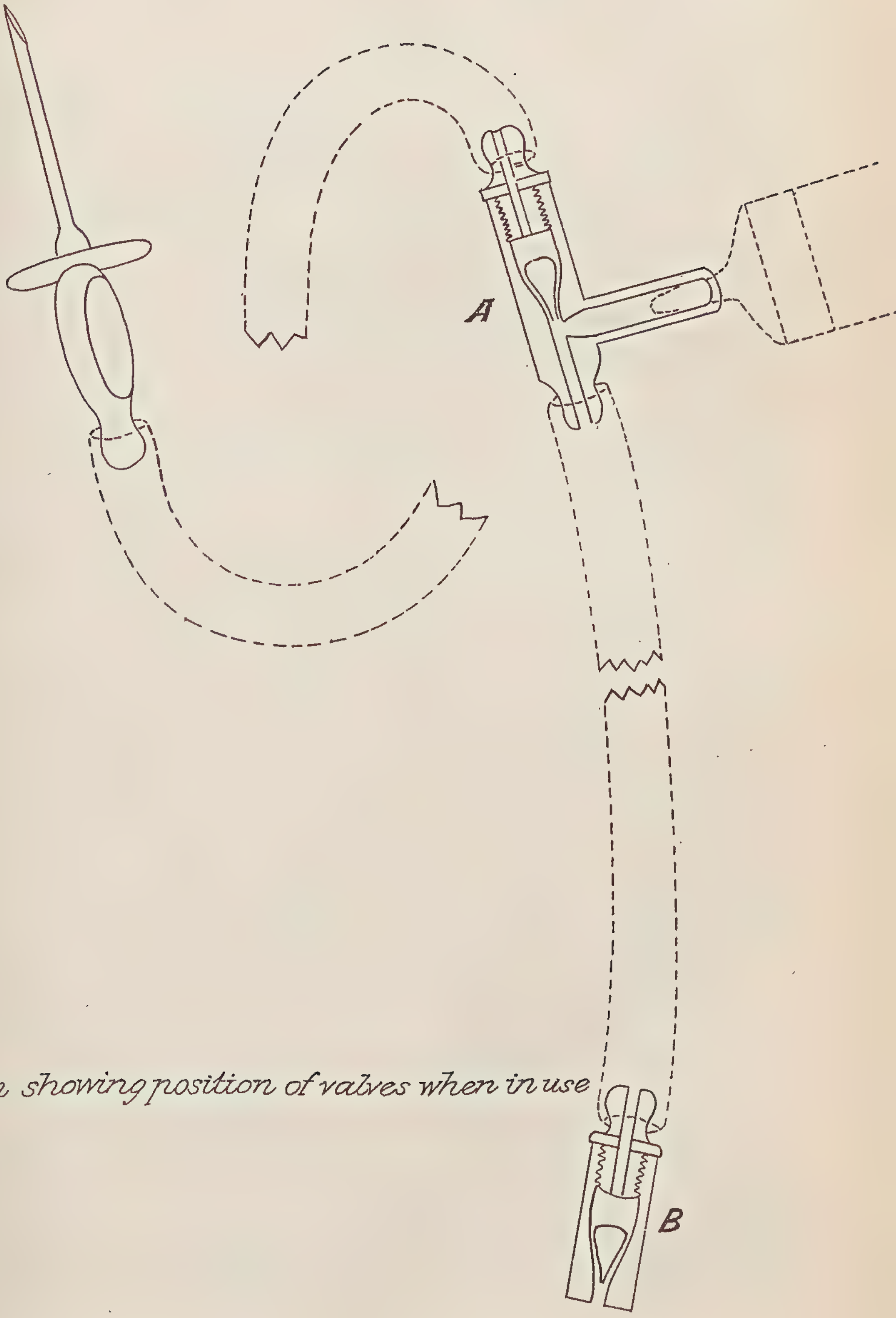
THE IMPROVED DOUBLE-ACTION VALVE APPARATUS.

This accessory is only required when hundreds of cattle are being put through in a day. The improved valves are arranged on exactly the same principle as the valves of a force-pump, so that, at every drawing motion of the plunger, the valve controlling the suction or reservoir tube is opened, and the valve of the delivery or injection tube is closed, the syringe being thus filled, while at any pressure of the plunger the suction-valve is closed, and the delivery-valve opened. The blood, once it has left the supply-bottle, cannot be returned to it through the tube, but can only be ejected through the long tube to the point of the hollow needle, so that, when the needle is placed in position under the skin of an animal, that animal must infallibly receive an injection of blood when the plunger of the piston-rod is pressed home.

The short piece of rubber tubing connecting the suction-valve is held in proper position by a cork with a V-shaped piece cut out of its side lengthwise, and fitted into the neck of the bottle.

The syringe fitted with the improved valve and long tubing has many advantages:—

1. There is no possible danger to the syringe or the bottle of blood, as the operator in charge of same is enabled by means of the long piece of tubing to stand quite clear of the crush and the cattle to be inoculated.
2. The man in charge of the needle has nothing more to do than see that it is properly inserted under the skin of the animal, give the signal, and, after the blood is injected, withdraw the needle, and fix it in another animal.



Sketch showing position of valves when in use

3. On account of the tubing having a very thick wall and small aperture, it matters not how it is turned and twisted, as the progress of the blood will not be impeded.
4. During the operation the bottle of blood can always be protected from the direct sun's rays, and from the dust of the stockyard.
5. The work of inoculating can be carried on more expeditiously, and at the same time much more effectually, than by any other means.

THE CLINICAL (CATTLE) THERMOMETER.

Prior to the first experiments in preventive inoculation for Tick Fever, the clinical thermometer and its use were practically unknown to every stockowner in Queensland. However, it is interesting now to know that this want of knowledge is, in consequence of the information which is freely disseminated by the Stock Institute, fast disappearing, as evidenced by the fact that the demand for clinical thermometers for stockowners far exceeds the supply. To the stockbreeder and dairy farmer, the clinical thermometer is most invaluable; for by its use the registration of the body heat affords a ready means of marking the rise and fall of all fevers; likewise the thermometer can be advantageously employed to ascertain whether or not an animal reacts to the injection of blood taken from an animal recovered from natural Tick Fever, as in the case of calves to be rendered immune for the supply of blood for general inoculation purposes.

The clinical thermometer, as approved of and made for the Queensland Stock Institute, consists of a cylindrical tube, hermetically sealed at both ends, about 6 inches long. At one end there is a bulb, the glass of which is very thin and filled with mercury. Running throughout the stem there is a very fine capillary bore, so as to allow the mercury to rise and fall. Immediately above the bulb the fine tube is so constructed that at this particular point the column of mercury from the bulb becomes detached from the column in the stem, causing the latter (a so-to-speak rod of mercury) to act as a register or index. Were it not for this little rod, it would be impossible to gauge accurately the temperature of the animal under observation. Hence the reason why such a thermometer is called "self-registering." Engraved on the glass stem are a number of strokes of three different lengths—viz., long, medium, and short. Opposite the first-named, we have the figures 90, 95, 100, 105, and 110, which indicate the number of degrees upon the scale of Fahrenheit. Between each of these numbers we find four "medium" length strokes, meaning degrees, although not marked in figures. Supposing that the end of the column of mercury stands immediately opposite the medium-length stroke after the figure 100, then it would imply a temperature of 101 degrees F. Lastly, there are the short strokes between those of medium length. Each short stroke has the value of one-fifth of a degree, but it has become general to read clinical thermometers to the fraction of tenths of a degree, therefore the space between the short strokes is more properly spoken of as two-tenths of a degree. By way of illustration, let us assume that the index column of mercury rises in the small tube of the stem to the first short stroke after 105. This would imply a temperature of 105·2 degrees F. (*i.e.*, $105\frac{2}{10}$); if to the second short stroke, 105·4 degrees F. Again, supposing the mercury rises up to half-way between the second and third short stroke, just above the long stroke 105, then we should say that the temperature was 105 *plus* $\frac{5}{10}$ F.—expressed in figures thus: 105·5 degrees F.

The majority of thermometers are so constructed that the index column, which is exceedingly fine, is magnified when it is observed at a given angle, in order to facilitate the reading.

The way to use the clinical thermometer is by taking it in the right hand, grasping the stem firmly with the fingers, and giving the arm a swinging or centrifugal jerk from the elbow, so as to bring the mercury column or index down below 95 or thereabouts. Now raise the tail of the animal with the left hand and quietly insert the bulb, and nearly the whole of the stem also, into the

rectum, keeping hold of the extreme end of the stem with the right-hand fingers. Allow it to remain for not less than 4 minutes, and on withdrawing it note where the index stands. This gives the temperature of the body. While taking the temperature the animal should be in a standing position. At the top end of the thermometer the glass is enlarged to form a little knob, below which a piece of string about 12 inches in length is tied, with a loop on the end to be placed over the finger of the operator, in order to prevent the thermometer from falling to the ground when taking an animal's temperature.

When the animal (cow or ox) is in perfect health, its temperature should be 101·4 degrees F. (calves are usually a trifle higher than adults.) Anything above 103 degrees F. indicates sickness. As a rule, just before death the temperature of the body falls considerably below the normal.

A temperature of	103	degrees implies	slight fever.
" "	104	" "	moderate fever.
" "	105·6	" "	high "
" "	106 to 108	" "	very high "

The last temperature could not be long endured.

Common abnormal or fever temperatures are 104 degrees, 105 degrees, and 106 degrees, with their intervening fractions of degrees, though less frequently above the last-mentioned number.

It should be specially noted that a temporary high temperature is commonly found after exercise, and is very often caused by excitement.

Rules to be observed in using the thermometer :—

1. Never place a clinical thermometer in hot water, for, considering that it only registers just about 110 degrees F., it is certain to burst where the glass is thinnest at the bulb.
2. Never allow the animal to drink freely just before taking the temperature, as the body heat is lowered when an animal drinks cold water.
3. Care should be exercised that the thermometer is read in the horizontal position.
4. Always record temperatures in a book kept for the purpose for future reference, and never trust to memory.
5. After each reading, the mercury index should be knocked down to below the normal.
6. Before putting the thermometer away in its case, cleanse it thoroughly with a solution of 1 in 20 carbolic acid.

GENERAL ADVICE.

The success of inoculation entirely depends upon several important factors, which as a rule are not readily adopted by a large number of stock-owners. However, the minimum of losses have occurred among cattle inoculated where the following rules have been strictly adhered to :—

1. Absolute cleanliness during the process of drawing the blood.
2. Using only perfectly disinfected instruments.
3. An egg whisk should not be used for defibrinating the blood, as it is liable to break up the fibrin into small fragments.
4. Exposure for even a short period to the direct sun's rays is extremely detrimental to blood, and impairs its qualities for inoculation purposes.
5. It is advisable that, as dust is certain to arise in the stockyard during the operation of inoculating, the mouths of the bottles containing defibrinated blood should be kept well covered with several pieces of clean linen or calico, and kept in a cool shady place.

6. (*a*) No more blood should be taken from an animal and defibrinated than can be used within six hours, for if kept longer the blood is apt to become contaminated with various kinds of bacteria, which are floating about in the atmosphere of the stockyard or shed, or other foreign matter, which, injected into an animal, might either produce blood-poisoning or an abscess.
   (*b*) For general inoculation purposes, only use the blood from an animal that has given a decided reaction after an injection of either recovered or virulent blood.
7. Five c.c. of blood has been found to be a standard dose for animals of any age and either sex.
8. Inoculation should proceed steadily, care being taken to avoid all attempts at breaking records.
9. During hot summer weather inoculate only early in the morning and late in the afternoon.
10. (*a*) Never inoculate cows heavy in calf.
    (*b*) It should be remembered that old bulls are the most susceptible of all animals; therefore, if there is no immediate danger from natural tick infection, it is inadvisable to inoculate them.
11. It is advisable, when inoculating on an extensive scale, to occasionally examine and test the needle and syringe, in order to see that they work freely, as a little piece of dirt or a hair will throw the valves out of order.
12. Cattle should be inoculated as near to their own pastures as possible, and in any case should, if inoculated some distance away, be allowed to travel back slowly without the aid of whips and dogs.
13. After inoculation, cattle should not be disturbed or interfered with in any way for at least three weeks.
14. During the cold weather in winter months it has been proved that blood can be carried with safety in well-corked clean bottles for from twenty-four to thirty-six hours either by rail, coach, or on horseback.
15. All the inoculating instruments, before and after use, should be thoroughly disinfected with 1 in 20 carbolic acid solution.
16. The rubber-washers and plunger of the piston-rod should be thoroughly cleaned and washed in carbolic solution, and a little glycerine applied, which will prevent the rubber from becoming hard and deteriorating.
17. It is advisable in the latest form of syringe to soak the red rubber washers in warm water before use.
18. Never use vaseline or oil of any description on the rubber parts of the syringe. Glycerine is the best lubricant.
19. The needles and trocar after use should be well washed in boiled water, then rinsed in carbolic acid (1 in 20) solution, carefully dried, and rubbed all over with a little vaseline.
20. Never disinfect any of the inoculating instruments with corrosive sublimate (bichloride of mercury) solution, as it readily corrodes the nickel plating.
21. The long pieces of rubber tubing when not in use should be kept under water, to which a few crystals of thymol have been added, in a large, well-stoppered, wide-mouth jar.

Important Note.—It should be specially pointed out that repeated experiments have shown that some animals do not react to the first inoculation; therefore it is recommended that, wherever practicable, cattle be inoculated a second time after an interval of not less than six weeks, for experience tends to prove that a second inoculation rarely ever fails. Moreover, by following this mode of procedure, stockowners have the satisfaction of knowing that the possibility of their cattle not being immune to a subsequent attack of natural Tick Fever is reduced to a minimum.

Forestry.

THE following remarks offered by Mr. A. Molineux, F.L.S., F.R.H.S., General Secretary of the South Australian Agricultural Bureau, on the subject of reafforestation of the treeless portions of the colony, are well worth earnest consideration. As a people, we in Queensland are busy preparing a bad time for our posterity. During the first half of 1898 we published a series of articles on Forestry, and dwelt forcibly on some of the points brought out by Mr. Molineux. Here, timber is becoming scarcer, and the process of destruction is more rapid—the more people settle on the land. No sooner does a man take up a selection than he proceeds to cut down, grub out, or ring-bark every tree on the place. He wants to cultivate, he wants grass for his stock, he wants firewood, and the trees must go; there is no help for it. Neither he nor his neighbours who play the same little game ever pause to think of the value of trees apart from a sawmill or cooking point of view. We recommend such to read carefully the following article—to inwardly digest it and become wise in time.

The time must come when the State will take our forests in hand and stay the universal destruction, but will it be too late when that time has arrived? We still have scrubs crowded with pine, cedar, beech, crows' ash, silky oak, &c. We have quantities of swamp mahogany and of valuable Eucalypts in our forests, but the insatiable demands of sawmills, railways, fences, wharves, &c., are ever increasing, and the result must be disastrous. With a Forestry Department, this demand could be satisfied without impairing the productiveness of the forests. The Department of Agriculture has shown in a practical manner what can be done in the matter of forest conservancy, and we should like to see the good work expand until it embraces the whole of the wooded areas of Queensland.

THE INFLUENCE OF FORESTS.

South Australia, considering its area, has less wooded land than any dependency under British rule. If all the scrub land and timbered country were divided amsngst the population, there would probably not be a quarter-acre for each soul. What would be the result if our population were increased to two or three million? Already in parts of the North they have to cart firewood from thirty to thirty-five miles. Fences are getting old, railway sleepers are decaying, telegraph poles need renewal, bridges do not last for ever. Miners require much timber; furniture, machinery, implements of many sorts, ships, boats, wagons, carts, and very many articles need to be made of wood, and we ought to grow timber for all of these purposes instead of sending to distant countries for supplies from their rapidly decreasing forest areas.

Apart altogether from utilitarian uses, trees are necessary as breakwinds in many localities. They beautify the landscape, and exercise a most decidedly beneficial effect upon the atmospheric and climatic conditions where they exist in any considerable number. The leaves absorb carbonic acid gas which is injurious to animal life, and give forth oxygen which is highly beneficial to animal existence. Living vegetation tends to equalise temperature—to raise it when cold and to reduce it when hot. It is a fact that living vegetation maintains a normal temperature, just as animals do. The normal temperature of man is 98 degrees F., and if this rises to 104 degrees F. he is in a fever, and will die if it rises two or three degrees higher. On the other hand, if the temperature falls a few degrees below 98 degrees F. he will become torpid, and will die if his temperature cannot be elevated. Heat is conserved in the animal by a closing up of the pores, and heat is reduced by opening of the pores, profuse perspiration, and a refrigerative action is set up by the rapid absorption of the

moisture in the air. This can be hastened by the use of a fan. Very much the same thing occurs in vegetable life. Living vegetation possesses a normal temperature of 45 degrees F. to 50 degrees F. When the weather is very hot the spiracles or pores open, and there is considerable transpiration of moisture. Exact observations by American scientists have shown that a moderate-sized soft-leaved tree will transpire as much as 40 gallons of water per day. It is easy to imagine that a very large quantity of water must be thrown out upon the air when we remember that trees renew their leaves and make a deal of growth every year. Deciduous trees throw their leaves within a week or two ; evergreen trees are shedding and renewing all the year round. Nearly all, if not all, this growth is made by the sap brought up from the roots. This sap contains a very small portion of solids, but only those solids are used in the construction of leaves, twigs, wood, bark, &c. All the rest, consisting of water, is transpired, and goes into the air. What an amount of moisture there must be thrown into the atmosphere where large areas of forest exist! In the course of transpiration and absorption a cooling effect is naturally produced. What would be the effect of the presence of a large bulk of living vegetation having a normal temperature of, say, 50 degrees F. when the air temperature is at 100 degrees F. or even 150 degrees F.? It is well known that hot air is always moist air, and that air will absorb moisture according to its temperature. When it is cooled down, it parts with an equivalent portion of its moisture ; so, when a hot wind comes into contact with a mass of cool green vegetation, it must be cooled, and it must part with some portion of its moisture. Where tall trees exist, there is shade, and shade is cooler than the open sunshine—every animal knows this—and even the shade of a rock is cool. The shade under tall green trees is much cooler than under rocks or walls. During very hot weather the difference between the heat in the open and beneath the shade of green trees is very considerable. Beneath the shade of forests a rich humus is formed, and this keeps the roots cool in summer and warm in winter, besides absorbing and retaining a great quantity of water. By this means the springs are kept supplied, and rivulets are maintained. When the trees are destroyed the humus is quickly burned up by the heat of the sun, and instead of the rains and dews being retained all the water rushes at once into the channels and away to the sea. The soil is impoverished greatly, and plants perish for want of moisture. Everyone knows that dark substances absorb heat, and light dry substances radiate or throw off heat. Where large forests exist, the leaves absorb and reduce heat. Where large areas of open country prevail — especially where dry grass, bare soil, and white vegetation only grows — there is a great radiation of heat, a tremendous expansion of the air above, and therefore there is a very large area of "high pressure" to be pushed out of the way when a "low pressure" area approaches our coast. If it were possible to establish a thousand square miles of forest in the Far North, it would most probably have a most beneficial influence on the climate to the southward, because there would be an area of much lower pressure over the forest That South Australia once possessed large forests and a great rainfall is evident from the great deposits of bones of monstrous kangaroos, wombats, marsupial lions, and moa birds so far north as Lake Callabonna or Lake Mulligan. These monstrous animals could not have existed without a most luxuriant vegetation, and no doubt exists that these conditions prevailed long since the glacial period, which also once prevailed. What brought about the destruction of the heavy forests and cessation of the tropical rains, no one at present can explain. It may have been due to an inroad of girdling insects, or to a rather long period of dry weather and occurrence of disastrous fires, but that there was once luxuriant vegetation is quite as certain as its absence now. It would be as wrong in himself to dogmatise upon the matter as it is wrong in others to do so in a contrary direction. It did not follow because a man was scientific in regard to geology, entomology, or any other "ology" that he should be able to decide positively that "trees do not exercise any influence upon climate, rainfall, temperature,

humidity," &c., but there have been men, profoundly learned in some "sciences," who were quite ignorant in respect to others, who have presumed to make the assertion just quoted.

History records hundreds of cases where the destruction of forests resulted most disastrously upon the climate of the denuded countries, and in some cases the re-afforestation of those places—always effected under almost insuperable difficulties—brought about the former prosperous conditions. In the *Agricultural Gazette* of New South Wales, vol. vii., p. 28 (January, 1896), is given a statement of the condition of the provinces of Tartary in 1826, the most noted being that of Soyd, as described by Malte Brun, in writing of the Khanate of Bucharia, or Bokhara. "For eight days (says Iban Hanhob) we may travel in the country of Soyd, and not be out of one delicious garden. On every side villages, rich cornfields, fruitful orchards, interspersed by rivulets, reservoirs, and canals," and so on. About 1876 another writer said: "The Khanate of Bucharia presents a striking example of the consequences brought by clearing. Within a period of thirty years this was one of the most fertile regions of Central Asia, a country which, when well watered, was a terrestrial paradise; but within the last twenty-five years a mania of clearing has seized the inhabitants, and all the great forests have been cut away, and the little that remained was ravaged by fire during the civil war. The consequence was not long in following, and has transformed the country into a kind of arid desert. The watercourses have dried up, and irrigating channels are empty. The moving sands of the desert, being no longer restrained by barriers of forest, are every day gaining upon the land, and will finish by transforming it into a desert as desolate as the solitudes that divide it from Khiva.

The "roof of the world"—the Himalayas—on one side is almost a desert now, but was once very populous, until the forests were destroyed. The other side of the same mountains is heavily timbered, has a large number of big rivers, and maintains an immense population. The now arid plains of Australind (South Asia) were once heavily timbered, but the trees were destroyed, and desolation followed. Germany, Greece, Italy, Spain, France, England, South Africa, India, all have suffered from destruction of forests—England less than the others, owing to her position, but where forests now exist they are near the coast, and not inland. On the Continent, owing to forest destruction, several streams that were once navigable by ships will now hardly float a rowing boat. In America enormous areas have been denuded by axe and fire, and the destruction is proceeding so rapidly that the Government is becoming alarmed, and is making efforts to stop the destruction and to re-establish the forests. So far, however, there are a thousand acres denuded for every acre replanted. The Russian steppes, now so cold in winter and so fiercely hot in summer that existence there is almost impossible in parts, were once heavily timbered and maintained a teeming and prosperous population. General Dibitsch Balhanasky was responsible for this woeful work. When Ali Pasha burned the forests of Peloponnesus, he brought famine and desolation upon an earthly paradise. Cases illustrating the same effects are recorded concerning the islands of Ascension and Mauritius, the Azores, Denmark, Sweden, &c.

On the other hand, where aridity once prevailed, by the planting of extensive areas with trees rain and fertility have been brought about on the Delta of the Nile. Within our own times there used to be only an average of six rainy days in the year. The Khedive caused millions of eucalypts to be planted during the past forty years, and now the average of rainy days has been increased to forty per annum. Napoleon III. caused millions of trees to be planted in France, with surprisingly beneficial effects, and in Algiers he had thousands of acres covered with trees, thereby doubling the number of rainy days.

Plate LXXXI.

HARVESTING WHEAT WITH REAPER AND BINDER ON THE DARLING DOWNS.

It is undoubtedly true that there is an arid belt running through Australia, Africa, &c., but where forests cross that belt, as in New South Wales and Western Australia, there is a heavy rainfall. It may be claimed that the Australian Alps intercept and cause a rainfall in the eastern colony, but that is not the case in the west. South Australia stands between two points in this longitude, and her average is 20 inches, against 40 inches to 60 inches in the other places.

General Notes.

THE LONGERENONG AGRICULTURAL COLLEGE.

A few weeks ago, at a meeting of the Council of Agricultural Education, it was decided to take steps to reopen the above college, and a sub-committee was appointed to prepare a report setting forth the basis on which the institution should be conducted in future. It was stated that the college would not have been closed had it not been for three successive bad seasons, and but for the fact that owing to the failure of the crops it was impossible to give students the instruction in the harvesting of crops which was essential in any system of agricultural education. Moreover, the continuation of the drought had resulted in the council having to make substantial reductions in the rent of their endowment properties, most of its tenants having suffered severe losses. Since, however, there was a prospect of having a good season, there was no reason why the opening of the college should be further delayed, especially as some 600 or 700 acres, which had been sown with different crops, were coming on nicely. It was considered it would take two months to secure the necessary teaching staff, and to obtain a sufficient enrolment of students to justify the opening of the institution.

WHITE ANTS.

That the white ant, or rather termite as the insect should properly be called, will attack growing wood is an undoubted fact, however it may be disputed. Everyone who has had anything to do with arboriculture on sandy, shaley soils knows this to his cost. We had an avenue of *Poinciana regia* trees in the neighbourhood of Brisbane, and every one was attacked by the pest. None, however, died, as great care was taken to drive them off. At Normanton, in the Gulf country, it is said to be impossible to grow any shrubs, owing to the attacks of enormous termites, unless a sheet of galvanised iron was placed round the roots underground.

The *Tropical Agriculturist*, of Colombo, however, has a good word to say for the insect, and perhaps not without reason. First, the ant benefits the planter by destroying all decayed wood lying on the ground and converting it into soil. The next benefit is that the soil is literally honeycombed by the tiny termites, and is thus being thoroughly ærated now, and all will render the passage of water through it easy when the rains do come. So, like the humble earthworm, it answers a very useful purpose in the economy of Nature, and under certain circumstances is a very useful friend to the agriculturist.

A NEW WEED-DESTROYER.

Mr. M. Swinburne, of North Toolburra, Warwick, writing on 19th November, says:—Some time ago I noted in the pages of your *Journal* a weed-destroyer recommended by the Curator of the Botanic Gardens, Mr. Mac Mahon, called the "Avery garden plough." As I could not quite see

how a plough could do much in the way of weed destruction, I gave the matter no further attention, though weeds were the bane of my existence. Shortly afterwards I made Mr. Mac Mahon's acquaintance, and last month he came for a few weeks' holiday with me at North Toolburra. I had taken the weeds in hand myself; and although I slaved away with a dutch hoe for several hours daily, weeds stared me in the face everywhere.

I was lamenting this when Mr. Mac Mahon said he knew of a tool whereby four times the work could be done in an equal time and with much greater ease.

Of course I declined to believe this, and offered to back my opinion by a wager, which was declined as being a foregone conclusion. He wrote to Brisbane for the tool, which soon came, and a frail thing it looked; but when I saw how he sent it flying amongst the weeds, holding the handles in his little fingers to show the small power required, I realised that I had dropped on to a good thing, There were also a plough to hill up or dig, a pulveriser, and narrow tines for plants close together. It will cultivate between lines 3 inches apart, and, with the broad sweep which Mr. Mac Mahon has specially fitted to it, will cultivate 12 inches wide, pulverising the soil from 1 to 4 inches deep. After a few minutes' trial, I found I could manage it perfectly. This is not done by main strength and stupidity. Very little strength is required when the knack is learned.

In a few hours on the first day I had done as much as in the previous week, so that I soon found that Mr. Mac Mahon's estimate was below the mark rather than above it.

I immediately asked Mr. Mac Mahon to use his kind offices in procuring me one of these most useful tools, as did also a neighbour who has a large vineyard. One of my men very quickly fell into the way of using it.

A HEAVY HIDE.

IN May last Messrs. B. D. Morehead and Co. sold a hide weighing 80 lb. at $10\frac{1}{8}$d. per lb., thus realising £3 7s. 6d. This, of late, has been considered a record price for a hide, but many years ago, when bullocks sent to market were far heavier than they are now, even higher prices were obtained. During this month, however, Messrs. Fenwick and Co. sold a hide weighing 95 lb. at $12\frac{1}{2}$d., thus obtaining £4 18s. $11\frac{1}{2}$d., a price which beats the last record by £1 11s. $5\frac{1}{2}$d. The hide was sold for Mr. W. H. Ashton to M. A. E. Cornell, who will tan it for Mr. John Hunter, of boot palace fame.

SKINNING, SALTING, AND FOLDING HIDES.

A STATION correspondent of the *Queensland Grazier* gives the following practical instructions for properly skinning beasts, and subsequently dealing with the hides:—In skinning beasts, avoid cutting the hides, and do not leave flesh on; this affects the sale to a greater extent than is generally supposed. When trimming, cut off from the knee, and the hind shanks from the hocks, also the head, ears, and face pieces, leaving the cheeks only. After trimming lay the hides flat, one on top of the other, butt to butt, on a clean floor with a little slope, to allow the brine to drain out; as laid down they should receive from 10 to 12 lb. of salt, and be left in salt fully eight days before being taken up; when taken up, shake out the surplus salt and sweep the hides before rolling up for market. The salting varies according to the size and thickness of the hide, and should be spread evenly over, the butt part receiving the most. A great loss is often occasioned by the want of a few extra pounds of salt (a trifling cost in itself), for the hides become slippy or loose-haired, causing them to be sold as faulty, and incurring a loss of $\frac{1}{2}$d. to 1d. per lb. in price. Cleanliness is the only thing required to give the hides the kind of flesh desirable. When folding, the flesh side to be the inside; throw the head towards the tail, the fold starting from the wither, the sides to be thrown in, meeting at the centre of the hide, and then rolled tightly from

the head and securely tied with two pieces of strong lashing at each end, attaching to same a piece of leather or tin with owner's initials marked on in ink, and also an address label.

ADMINISTERING A BALL.

HOW IT SHOULD BE DONE.

To the administration of a bolus or ball to the equine species it is necessary that the administrar should have confidence in himself—not afraid that his hand should be scratched or bitten by the teeth. In the first place, reverse the horse in the stall, so that he cannot go back from you; then insert the left hand into the mouth on the right-hand or off side of the head, between the incisor or front teeth and the molar or back teeth, grasp the tongue firmly with the left hand, pull it out, gently, 2 or 3 inches, so that it is stretched beyond its normal or natural situation. When the administrar commences operations, cause a groom or assistant to stand by the near or left shoulder, lay hold of the lower jaw by the four fingers of the left hand, pull it down and, at the same time, insert the thumb of the right hand on the upper jaw, as in Fig. 1. In this manner, the jaws will be fixed. The administrar now holding the tongue securely in his left hand, picks the ball out of his right-hand waistcoat pocket with the corresponding hand gathering the fingers and thumb well round it, runs the hand along the roof of the mouth, between the upper molar or back teeth, and places the ball at the inferior third, or as

FIG. I.

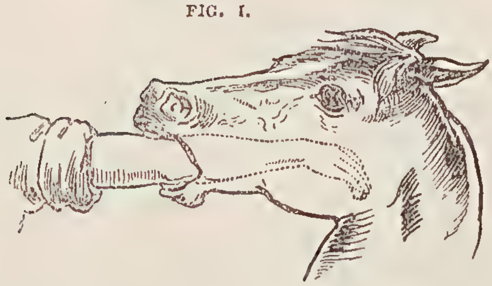


FIG. II.

near the root, of the tongue as possible, as in Fig. 2. He then withdraws his arm, lets go the tongue, tells his assistant to loosen the jaws, when by the retraction of the tongue, the ball is carried over the throat, down the gullet, into the stomach. If the ball is given as directed, the animal cannot cough it up; but if it is only placed on the middle third of the tongue, it is optional on the part of the animal whether he swallows it or not. If the animal is closely watched, the ball is frequently seen passing down the gullet on its way to the stomach. Give a slight drink of water after administration.—*Agricultural Gazette*, London.

HOW TO VANQUISH THE MOSQUITO.

ACCORDING to an American paper (the *Public Health Journal*), the dreaded mosquito, which is such an intolerable nuisance in the summer months, more particularly along river banks and on the sea coast, can be easily abated by the use of a very simple remedy. It is stated that but two and a-half hours are required for the development of the full-grown mosquito from a mere speck, its first stage. It can be instantly killed either in its infancy or at maturity by contact with minute quantities of permanganate of potash, the cheap purple salt which is used so much for disinfecting purposes. It is said that a solution of the salt containing only one part in fifteen thousand of water, distributed in the marshes where the mosquito breeds, will render the development of their larvæ impossible. To quote the *Journal* itself:—"A handful of permanganate will oxidise a ten-acre swamp, kill its embryo insects, and keep it free from organic matter for thirty days at a cost of 25 cents. With care, a whole State may be kept free of insect pests at a small cost. An efficacious method is to scatter a few crystals widely apart. A single pinch of permanganate has killed all the germs in a 1,000-gallon tank."

ONIONS—A REMEDY FOR SLEEPLESSNESS.

NOT many people are aware that the onion contains a principle which acts on the nerves in a manner similar to the action of opium.

Unfortunately, the persistent odour of the vegetable makes sensitive persons disinclined to use them, at all events in the raw state. Now, an onion taken at night is one of the best sleep-inducers. The element above mentioned has the effect of calming the nerves, and consequently of lulling the brain to rest.

Onions with salt are much used in the old country for the reduction of chilblains. They are also efficacious, used as a poultice, in the matter of sprains, boils, &c.

In fact, they are generally excellent both as a medicine and as a vegetable.

Onions, apples, and grapes are amongst the best vegetable medicines.

MILK CHAMPAGNISED.

IN a French agronomical publication it is affirmed that Mons. Cossins has invented and patented a new process for sterilising all fermenting liquids. He places the fluid to be operated on in a closed vessel, and subjects it to a stream of oxygen proportionate to the quantity of fluid. Milk can thus be kept for any length of time after the sterilising process. To make champagne milk, which also keeps any length of time, and is a most delicious and refreshing drink, sugar and an aromatic essence are added to the milk, which also receives a quantity of carbonic acid gas in a closed vessel.

ANTIDOTE FOR CHLOROFORM.

IT will be remembered that in November last Dr. ——— was successful in restoring to consciousness a patient who seemed likely to succumb to the effects of chloroform administered for operating purposes. He gave the patient a hypodermic injection of permanganate of potash, which had the effect of completely neutralising the chloroform, and the subject recovered almost instantaneously. An American (Dr. Moor) lately proved the value of this antidote which he claims to have discovered, by swallowing three grains of morphine, and immediately afterwards taking a solution of six grains of permanganate of potash in four ounces of water. The morphine was taken in the presence of twelve other doctors, who, it is said, were satisfied that the morphine was neutralised, as it had not the slightest effect on Dr. Moor. Such a simple antidote to narcotic poisons should never be wanting in the family medicine chest.

TUBERCULOSIS.

In the course of a speech delivered to the students on the occasion of the opening of the new session of the Royal Veterinary College, Camden Town (London), Mr. Walter Long referred to the efforts being made to stamp out tuberculosis by means of tuberculin. The Royal Commission of this year had favoured the use of this medicine, and had reported that one dose for each cow cost 3d., whereas the expense of testing, attendance, &c., reached 2s. 3d. for each cow. With regard to the valuable discovery to which he was referring, it might also be said that it was the most important one of the age, because if they succeeded in stamping out tuberculosis in animals, by means of tuberculin, it was believed they would be able to do the same thing with human beings, so that consumption—that dreadful scourge, which it had been said could neither be prevented nor cured—might also be stamped out.

TUBERCULOSIS AND INFECTION.

DOES MEAT CONVEY THE DISEASE?

Professor Nocard having injected from ten to twenty minims of muscle (meat) juice into guinea-pigs, derived from the tuberculous hearts of animals dead of the disease, found that none of them became affected. Another experiment performed by the same authority upon forty guinea-pigs resulted in the inoculation of one only, that is to say in the production of tubercle.

He concluded that, if there were danger in the flesh of tuberculous animals, it was quite exceptional. Martin's experiments, made for the Royal Commissioners, showed the bacillus to be present in two guinea-pigs out of twenty-one inoculated with the virus.

Sims Woodhead's experiments on cooked meats are rather startling, as we had grown to believe ourselves safe from tubercle bacillus in food, if properly cooked. He says that in joints over about 6 lb. weight the temperature in the middle seldom exceeds 60 degrees F., no matter how high the outside temperature. "This is an hard saying; who shall hear it?" Could we really get meat nicely cooked ("the nearer the bone the sweeter the meat") without the temperature going higher than the atmosphere of an average autumn day? Mr. E. Marrison, M.R.C.V.S., in an essay on the subject, referring to the above experiments, comes to the conclusion that "food derived from tuberculous animals can produce the disease in healthy animals, and therefore I think we are perfectly justified in condemning all such carcases." So says Mr. Marrison, but it is fortunate, as we have before pointed out, that our British Government moves slowly, and that the opinions of enthusiasts are not immediately acted upon without time and trial and long observation by independent observers. It is a fact that from time to time some very important subject is taken up with an enthusiasm which develops into a firm conviction *without proof*. Scientific men of all others should be free from these passing illusions; they are but men with all their study and devotion to the promotion of knowledge; hence they become infected with notions which would land their Governments into such mistakes as that made by the young German monarch, when he forced the hand of Koch. Curiously enough, Mr. Marrison adds, a little later on, "whether the disease in man is contagious is an open question, though numerous cases of supposed communication between man and wife, brothers and sisters, have been reported, and Ransome showed that tubercle bacilli were present in the breath in phthisis. On the other hand, the experience in consumption hospitals does not support this view, there being no evidence of the communication of the disease to nurses and hospital attendants." Then who on earth would be infected, if not nurses and hospital attendants always among the bacilli floating in the air breathed by phthisical patients? Really it does seem like "straining at a gnat and swallowing a camel" when our scientific men minimise the hereditary danger of consumption, and try to prove that husbands and wives, brothers and sisters, catch the complaint of each

other instead of deriving it from the blood of their predecessors. It takes a good deal of faith on the part of the average man of common sense and even common observation to believe that his herd is more likely to be infected by a bullock whose breath shall give forth these bacilli, which, when thick as autumn leaves, in a Brompton consumption hospital, cannot be found to produce the disease in the nurses and attendants.—*Farmer and Stockbreeder.*

HOW EGGS ARE PRODUCED.

WHEN we read of billions of eggs being sent from the Continent to England, it never strikes us to look into the matter, and reckon how many fowls it would take to produce these vast quantities of eggs. Amongst the animals forming our food supply, the fish is credited with producing the largest number of eggs of any oviparian, yet the fish in the height of the spawning season would seem to have a hard struggle to beat the continental hen in "spawning" powers, for these prolific hens must actually spawn instead of lay, like any other respectable tenant of a British fowlyard.

This is what an eminent analyst is credited with stating, according to the *Australian Farm and Home*:—

EGGS NO HEN EVER SAW.

EUROPE MANUFACTURES THEM OUT OF STARCH AND OTHER THINGS.

Much has been written of the arts of adulteration, says an eminent analyst; but there is very little general knowledge of the extent to which foods are built up chemically, and successfully palmed off on customers as natural products. It will be a shock to many to learn that millions of eggs which have been bought and eaten as products of the hen have no connection with that useful fowl.

There are factories on the Continent of Europe where these "oviform frauds" are produced at the rate of many thousands a day, as simply and yet as mysteriously as so many sausages. The yolk is first quickly fashioned by machinery from a mixture of maize, starch, and one or two other ingredients, coloured with ochre. The yellow sphere is then placed in another "box of mystery," when the white part of the egg is added. The resultant ball is frozen and moulded into the requisite oval shape—again by machinery. It is then immersed in a third vat, which contains plaster of paris, and emerges with a shell which quickly assumes all the hardness and appearance of a genuine egg-shell. The process of thawing quickly reduces the contents of the shell to the consistency of a new-laid egg, and the artificial result is ready for the breakfast table or any of the uses to which eggs are put. These "eggs" can be profitably manufactured to sell at prices ranging from 4c. to 12c. (2d. to 6d.) a dozen, and are retailed at prices which yield anything up to 100 per cent. profit.

JERSEY CABBAGES.

THOSE who have never visited the Channel Islands will be slow to give credence to the fact that in the island of Jersey cabbages grow to a height of 10 feet, and some have even attained a height of 16 feet. This particular variety is found in Guernsey, Alderney, and on the French coast of Brittany, where it is known as the "choux cavalier," the great cow or branching cabbage. During its growth, leaves are thrown out from the stem. These leaves on attaining full size are used as fodder for cattle, and also for packing potatoes and butter. When the leaves are all stripped off, the plant resembles a palm-tree, being surmounted by a crown which is left until the winter frosts have nipped it, and it is then eaten by the farmers as ordinary cabbage. The tall stems become very hard when dry, and come in for a variety of uses, such as rafters for sheds, props for trees, sticks for running plants, and also for walking-sticks.

TO REJUVENATE OLD TREES.

An American orchardist recommends the following method of causing old trees to bear like young ones. He digs up around the tree without injuring the roots, and lays bare all the thick roots. These are split with an iron wedge three or four feet from the trunk, and a stone put in the cleft to keep it open. Fill in with good surface soil. New white feeding roots will grow from the clefts, and the tree will take on a new vigour.

As this paragraph is going the rounds of some of the agricultural and horticultural journals, we submitted it to Mr. A. H. Benson, Queensland Government Fruit Expert. That gentleman says:—This is a crude method of producing new root growth, which will probably do much more harm to the tree than good, as it is bound to produce more or less decay or gumming, and it encourages the attacks of root-boring insects of all kinds. A judicious root-pruning followed by a severe top pruning and good manuring is the best way of renovating old trees, as this course will give the tree new bearing wood and new roots.

Thus it will be seen that he practically condemns the process as injurious instead of beneficial, and we should recommend owners of old trees to try Mr. Benson's plan before possibly ruining what might become valuable trees if properly treated.

EXPORT OF LINCOLNS TO SOUTH AFRICA.

Mr. Henry Smith, junr., Cropwell Butler, Nottingham, has sent another consignment of Lincoln shearling rams to South Africa, where breeders are realising the necessity of improving their flocks with the Lincolns.

A very special ram lamb (No. A 233, Private Flock Book) has also been forwarded to a noted Lincoln breeder in Ireland. This ram is by Messrs. S. E. Dean and Sons' celebrated stud sheep Lincoln (1436); his dam is No. 718, sire the Biscathorpe ram Rainmaker (354).—*Farmer and Stockbreeder.*

WATER-GLASS.

We have had repeated applications by letter from correspondents anxious to know what water-glass is, as they wish to try it as an egg-preservative; and as inquiry is still being made by readers of the *Journal*, we republish the explanation given in the South Australian *Journal of Agriculture.*

Water-glass is silicate of soda. It is easily dissolved in water, and is used for a great many purposes. For egg preservation—boil ten gallons of water to kill all germs. When the water is cold, add to it a gallon of soda silicate or "water-glass," and pour over the eggs until they are immersed in the fluid. The cost of the silicate of soda is 10s. per cwt. in Europe, and 9d. per lb. for small quantities here.

MANGO STARCH.

As the mango season has now commenced, many will be at a loss what to do with the superabundance of fruit, which, of late, has been difficult of sale, and in many cases not worth the expense of gathering, packing, freight, &c. It is not generally known that the mango contains a quantity of starch which is scarcely distinguishable from arrowroot. When used in the same manner and boiled with water, the jelly is very similar to that of the latter. Mr. Watts, a chemist in Jamaica, reported lately on a sample of mango starch submitted to him by the Jamaica Agricultural Society, and he pronounced it almost pure starch of fairly good colour, though capable of being washed to a whiter condition. As an article of diet or of commerce, it will compare very favourably with arrowroot; this being so, he expresses some doubt whether it can be produced at a price sufficiently low to compete with arrowroot, of which the ordinary brands are selling in the wholesale markets at prices ranging from 2d. to 4d. per lb. We think the matter worth a trial, at all events.

CURING GINGER.

REFERRING to the article "Notes on Ginger," reproduced in our October number (p. 299) from the Journal of the Jamaica Agricultural Society, it will be found that an error has crept in, which the journal in question has hastened to correct as follows:—We have to point out that in the article "A Trip to the Ginger District," which appeared in our July number, the author made an unfortunate slip, in referring to the percentage of loss made in the curing of ginger, by reversing the figures. The paragraph should have read: "The loss in the peeling and drying process takes, some say, 66⅔ per cent., others 80 per cent." So that if the planter lifts 100 lb. of ginger from the soil, he has, after it has been peeled and dried, say from 20 to 33⅔ per lb. of cured ginger ready for market.

BROOM MILLET IN VICTORIA.

A BONUS of 5s. per cwt. is being offered by the Agricultural Department for the growth and production of marketable broom millet. Prior to the land being sown, the Minister has to be notified of the intention to apply for the bonus, and must approve of the application. No bonus is to be paid to any individual, association, or company for less than 10 cwt., or more than 20 tons of marketable broom corn. The question of the marketable quality of the millet is to be determined by an inspection of the crop by a departmental officer, after it has been harvested.

LAMPAS.

MR. D. HUTCHEON, C.V.S., says:—Lampas is inflammation of the mucous membrane covering the bars of the palate, situated immediately behind the upper row of incisor teeth of the horse.

Causes.—Teething in young horses, or it may be induced by hot food, or irritating medicine not sufficiently diluted. It is a very rare affection, although stablemen, as a rule, consider that every horse which has prominent bars has got lampas. It is difficult to understand how the idea of lampas being a common affection of the horse's mouth should have found such universal acceptance, because of all the domestic animals the mouth of the horse is the most frequently examined while the animal is in a state of health; consequently one would think that the normal condition and appearance of the bars of the palate would have been ascertained with something like exactitude by this time. Such, however, is not the case, for I have met with few non-professional men in this colony who appear to be familiar with the normal condition and appearance of the bars of the horse's palate. The history of this imaginary disease is somewhat as follows:—A certain horse refuses his food some morning, or he looks dull and dejected, and does not feed with his ordinary relish; the groom, having a strong predilection in favour of this affection, at once examines his mouth, and, finding the front bars of the palate level with or perhaps even below the level of the incisor teeth, immediately pronounces the animal to be suffering from lampas. He does not stop to examine whether these bars are inflamed in appearance or tender to the touch; whether it is their natural condition, or whether the bars of the palate of any of the other horses in the stable present a similar appearance. This obvious process of reasoning does not occur to him. But as a matter of fact in nearly all young horses, and in many old ones which graze on the veld, and have not been interfered with, the front bars of the palate are on a level with and frequently lower than the teeth, but their position in that respect is no indication of disease, nor of inconvenience to the animal. On the contrary, they are of great advantage to the horse, as anyone who watches them while grazing can observe. The horse gathers the grass with his lips, and cuts it with his incisor teeth, but he requires to hold the grass firmly in his mouth to enable him to cut it, and this he does by pressing the grass between the point of the tongue and the bars of the palate. This explains why a veld-fed horse has these bars

more fully developed than a stall-fed horse; the latter does not require to use either his incisor teeth to the bars immediately behind them, when feeding. Let us consider further what symptoms a horse would manifest which was suffering from an inflamed and tender mouth, but was otherwise in perfect health; such a horse would attempt to feed, but would manifest a difficulty in mastication, and this would be accompanied by a flow of saliva from the mouth. But in the so-called cases of lampas neither of these symptoms are present; the horse either does not attempt to feed or his food does not appear to be doing him any good. The whole of the symptoms clearly indicate that there is something wrong with the horse's general health; this being attended to the apparent lampas will relieve itself. I have enlarged on this simple subject in order to try and induce horse-owners to abandon the barbarous practice of burning out the front bars of a horse's palate, whenever he appears to be off his feed a little. Should the bars of a horse's mouth really become inflamed and tender, from teething, or from eating or drinking any hot or irritating substances, or from mistakes made in the administration of medicine, the *treatment* should be of the simplest character. If the bars are much swollen and inflamed, lightly scarify them, and rub in a little common salt or alum, or of both combined. Feed on soft food until the pain and tenderness have passed off. It is generally advisable to give a pint of raw linseed oil or some saline laxative in his food for a few days, as it is frequently associated with indigestion.—*Cape of Good Hope Agricultural Journal.*

MILK TESTING.

WHEN milk has been tested by the Babcock Tester, the amount of butter a given quantity of milk will produce, when showing a certain test, may be arrived at as follows:—

Multiply the number of pounds of milk by the percentage of butter fat. Divide the product by 100, and add 12 per cent. to the quotient. The result will show pounds of commercial butter.

EXAMPLE.

A cow yields 749 lb. of milk. The test shows 3·4 per cent. of butter fat.

$$749 \times 3{\cdot}4 = 2546{\cdot}6.$$
$$2546 \div 100 = 25{\cdot}46.$$

12 per cent. on 25·4 = 3·0.

$$25{\cdot}46 + 3 = 28{\cdot}46 \text{ lb. of commercial butter.}$$

AGRICULTURAL AND HORTICULTURAL SHOWS.

THE Editor will be glad if the secretaries of Agricultural and other Societies will, as early as possible after the fixture of their respective shows, notify him of the date, and also of any change in date which may have been decided on.

LIST OF AGRICULTURAL, HORTICULTURAL, AND PASTORAL SOCIETIES AND ASSOCIATIONS IN QUEENSLAND.

Postal Address.	Name of Society.	Name of Secretary.	Date of Show.
Allora ...	Central Downs Agricultural and Horticultural Association	J. H. Buxton... ...	1 Feb. 1899
Beaudesert ...	Logan and Albert Pastoral and Agricultural Society	M. Hinchcliffe ...	6 May
Beenleigh ...	Agricultural and Pastoral Society of Southern Queensland	Wilson Holliday ...	30 Sept.
Birthamba ...	South Kolan Agricultural and General Progress Association	G. W. Nixon ...	
Blackall ...	Barcoo Pastoral Society	F. Clewett	
Boonah ...	Fassifern and Dugandan Agricultural and Pastoral Association	J. A. McBean ...	28 April
Booyal Scrub	Booyal Progress Association	H. Masson	
Bowen ...	Pastoral, Agricultural, and Mining Society ...	J. E. Smith	8 June
Bowen ...	Preston Farmers' Association	R. A. Foulger ...	
Bowen ...	Proserpine Farmers' and Settlers' Association	G. W. Pott	
Brisbane ...	Horticultural Society of Queensland	G. K. Seabrook ...	21 and 22 April and 10 Oct.
Brisbane ...	Moreton Agricultural, Horticultural, and Industrial Association	J. Duffield	
Brisbane ...	Queensland Acclimatisation Society	E. Grimley	
Brisbane ...	Queensland Fruit and Economic Plant Growers' Association	G. K. Seabrook ...	
Brisbane ...	National Agricultural and Industrial Association of Queensland	H. C. Wood	10, 11, and 12 Aug.
Brisbane ...	Queensland Stockbreeders' and Graziers' Association	F. A. Blackman ...	
Brisbane ...	United Pastoralists' Association	Fredk. Ranson ..	
Bundaberg ...	Bundaberg Agricultural and Pastoral Society	A. McIntosh... ..	12, 13, and 14 Oct.
Bundaberg ...	Bundaberg Horticultural and Industrial Society	H. E. Ashley... ...	
Bundaberg ...	Woongarra Canegrowers' and Farmers' Association	H. Cattermull ...	
Burpengary...	Burpengary Farmers' Association	C. H. Ham	
Caboolture ...	Caboolture Farmers' Association	G. Mallet	
Cairns ..	Barron Valley Farmers' and Progress Association	W. F. Logan... ...	
Cairns ...	Cairns Agricultural, Pastoral, and Mining Association	A. J. Draper... ...	28 and 29 Sept.
Cairns ...	Hambledon Planters' Association	E. Whitehouse ...	
Charleville ..	Centra Warrego Pastoral and Agricultural Association	A. J. Carter	25 and 26 May
Charters Towers	Towers Pastoral, Agricultural, and Mining Association	W. Tilley	
Childers ...	Isis Agricultural Association	H. Epps	
Childers ...	Childers Progress Branch, Isis Agricultural Association	N. Rosenlund ...	
Childers ...	Doolbi Mill Branch, Isis Agricultural Association	W. T. H. Job ...	
Childers ...	Childers Mill Branch, Isis Agricultural Association	H. Epps	
Clermont ...	Peak Downs Pastoral, Horticultural, and Agricultural Society	F. Leysley	
Clermont ...	Peak Downs Dairymen and Settlers' Association	A. G. Pursell ...	
Cooktown ...	Cook District Pastoral and Agricultural Society	W. R. Humphreys ...	
Cordalba ...	Cordalba Farmers' Association	B. Goodliffe	
Currajong ...	Currajong Farmers' Progress Association ...	Wm. Howard ...	
Cunnamulla	South Warrego Pastoral Association	J. Winward	
Degilbo ...	Degilbo Farmers' Progress Association ...	F. A. Griffiths ...	
Gayndah ...	Gayndah Agricultural and Horticultural Association	J. C. Kerr	

AGRICULTURAL AND HORTICULTURAL SOCIETIES—*continued.*

Postal Address.	Name of Society.	Name of Secretary.	Date of Show.
Gin Gin ...	Pastoral and Agricultural Society of Gin Gin	E. K. Wollen ...	
Gladstone ...	Gladstone Pastoral and Agricultural Association	W. J. Manning ...	
Gooburrum, Bundaberg	Gooburrum Farmers' and Canegrowers' Association	W. J. Tutin	
Goondiwindi	MacIntyre River Pastoral and Agricultural Society	A. Gough	
Gympie ...	Agricultural, Mining, and Pastoral Society	F. Vaughan	14 and 15 Sept.
Gympie ...	Gympie Horticultural Society	W. G. Ambrose ...	
Helidon ...	Helidon Scrub Farmers' Progress Association	M. Morgan	
Herbert River	Halifax Planters' Club	H. G. Faithful ...	
Herbert River	Macnade Farmers' Association...	E. C. Biggs	
Herbert River	Ripple Creek Farmers' Association	J. W. Grimes ...	
Herberton ...	Mining, Pastoral, and Agricultural Association	John M. Hollway ...	11 and 12 April
Hughenden ...	Hughenden Pastoral and Agricultural Association	W. H. Mulligan ...	10 and 11 May
Ingham ...	Herbert River Farmers' Association	...	
Ingham ...	Herbert River Pastoral and Agricultural Association	P. S. Cochrane ...	3 Sept.
Ipswich ...	Ipswich and West Moreton Agricultural and Horticultural Society	P. W. Cameron ...	6 Oct.
Ipswich ...	Queensland Pastoral and Agricultural Society	Elias Harding ...	1 and 2 June
Kalkie ... (Bundaberg)	Woongarra Canegrowers' and Farmers' Association	O. H. A. Kraak ...	
Kandanga (near Gympie)	Kandanga Farmers' Association	N. Rasmussen ...	
Kolan ...	Kolan Canegrowers' and Farmers' Association	C. Marks	
Laidley ...	Lockyer Agricultural and Industrial Society	John Fielding ...	27 and 28 July
Loganholme...	Logan Farming and Industrial Association ...	F. W. Peek	
Longreach ...	Longreach Pastoral and Agricultural Society	J. P. Peterson ...	12 April
Lucinda Point	Victoria Farmers' Association	W. S. C. Warren ...	
Mackay ..	Agricultural, Pastoral, and Mining Association	F. Black	
Mackay ...	Pioneer River Farmers' Association	E. Swayne	
Maryborough	Maryborough Horticultural Society	H. A. Jones	
Maryborough	Wide Bay and Burnett Pastoral and Agricultural Society	G. Willey	27, 28, and 29 July
Milbong ...	Milbong Farmers' Association	T. R. Garrick ...	
Mitchell ...	Mitchell and Maranoa Pastoral, Agricultural, and Vinegrowers' Association	H. J. Corbett ...	
Mosman River	Mosman River Farmers' Association	..	
Mount Mee...	Mount Mee Farmers' Association	R. Thomas	
Mount Morgan	Mount Morgan Mining, Agricultural, Poultry, Pastoral, and Horticultural Society	G. Orford	
Mulgrave ...	Mulgrave River Farmers' Association ...	Thos. Swan	
Nerang ...	South Queensland and Border Pastoral and Agricultural Society	W. J. Browne ...	
North Isis ...	North Isis Canegrowers' Association	W. J. Young ...	
Pialba ...	Pialba Farmers' Association	J. B. Stephens ...	
Pinbarren ...	Pinbarren Agricultural and Progress Association	H. Armitage, senr. ...	
Rockhampton	Central Queensland Farmers' and Selectors' Association	T. Whitely, Coowonga	
Rockhampton	Central Queensland Pastoral Employers' Association	G. Mackay	

AGRICULTURAL AND HORTICULTURAL SOCIETIES—*continued.*

Postal Address.	Name of Society.	Name of Secretary.	Date of Show.
Rockhampton	Central Queensland Stockowners' Association	R. R. Dawbarn ...	
Rockhampton	Rockhampton Agricultural Society	R. R. Dawbarn ...	10 and 11 May
Roma ...	Western Queensland Pastoral and Agricultural Association	H. K. Alford ...	10 and 11 May
Roma ...	Yingerbay Farmers' Association	F. E. Glazier... ...	
Rosewood ...	Farmers' Club	P. H. Adams... ...	25 Aug.
Springsure ...	Queensland Pastoral Society	G. R. Milliken ...	
Stanthorpe ...	Border Agricultural, Pastoral, and Mining Society	Geo. Simcocks ...	
Stanthorpe ...	Stanthorpe Horticultural and Viticultural Society	R. Hoggan	
St. George ...	Balonne Pastoral and Agricultural Association	T. M. Cummings ...	
Toowoomba	Darling Downs Horticultural Association ...	H. Hopkins	
Toowoomba	Drayton and Toowoomba Agricultural and Horticultural Society	H. Symes	
Toowoomba	Royal Agricultural Society of Queensland ...	F. Burtt	2, 3, and 4 Aug.
Townsville ...	Townsville Pastoral, Agricultural, and Industrial Association (formerly North Queensland Pastoral and Agricultural Association)	J. N. Parkes	
Wallumbilla	Wallumbilla Farmers' Association	P. W. Howse ...	
Warwick ...	Eastern Downs Horticultural and Agricultural Association	J. Selke	25 and 26 Jan., 1899
Wellington Point	Wellington Point Agricultural, Horticultural, and Industrial Association	J. B. Blaine	6 Aug.
Woombye ...	Woombye Fruitgrowers' Association	P. S. Hungerford ...	
Woowoonga	Woowoonga Scrub Farmers' Association ...	H. B. Griffiths ...	

The Markets.

AVERAGE PRICES FOR NOVEMBER.

Article.		NOVEMBER. Top Prices. £ s. d.
Bacon	lb.	0 0 $7\frac{1}{16}$
Bran	ton	5 14 $4\frac{1}{2}$
Butter, First	lb.	0 0 $10\frac{1}{16}$
Butter, Second	"	0 0 $7\frac{3}{16}$
Chaff, Mixed	ton	3 13 9
Chaff, Oaten	"	3 16 3
Chaff, Lucerne	"	3 13 9
Chaff, Wheaten	"	2 15 0
Cheese	lb.	0 0 10
Flour	ton	10 6 3
Hay, Oaten	"	3 13 9
Hay, Lucerne	"	3 3 $1\frac{1}{2}$
Honey	lb.	0 0 2
Japan Rice, Bond	ton	16 2 6
Maize	bush.	0 4 $3\frac{3}{8}$
Oats	"	0 3 $6\frac{3}{4}$
Pollard	ton	5 16 3
Potatoes	"	9 13 9
Potatoes, Sweet	"	3 8 9
Pumpkins	"	7 6 8
Sugar, White	"	14 0 0
Sugar, Yellow	"	12 5 0
Sugar, Ration	"	9 12 6
Wheat	bush.	0 3 $4\frac{3}{4}$
Onions	cwt.	0 13 $4\frac{1}{2}$
Hams	lb.	0 0 $9\frac{3}{4}$
Eggs	doz.	0 0 9
Fowls	pair	0 4 $2\frac{1}{4}$
Geese	"	0 5 $8\frac{1}{4}$
Ducks, English	"	0 3 $7\frac{1}{2}$
Ducks, Muscovy	"	0 5 3
Turkeys, Hens	"	0 7 $4\frac{1}{2}$
Turkeys, Gobblers	"	0 18 9

ENOGGERA SALES

Article.	NOVEMBER. Top Prices. £ s. d.
Bullocks	5 11 3
Cows	4 3 9
Wethers, Merino	0 13 $9\frac{3}{4}$
Ewes, Merino	0 9 9
Wethers, C.B.	0 14 0
Ewes, C.B.	0 15 0
Lambs	0 11 $0\frac{3}{4}$
Pigs	...
Baconers	...
Porkers	...
Slips	...

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Orchard Notes for January.

BY ALBERT H. BENSON.

IN the Orchard Notes for the months of November and December, I have already drawn attention to the importance of careful handling and grading in the packing and marketing of all kinds of fruit. As there is a large quantity of fruit of various kinds to be marketed during the present month, it will not be out of place to again call attention to this most important part of the fruit-grower's work, as it is a branch that is often much neglected, despite the fact that the returns obtained from the orchard are largely dependent on the manner in which the fruit is got up for sale. During the month the mid-season crop of summer fruits will be ripe on the Downs and similar districts, and in the Southern Coastal districts the summer crop of pines and early varieties of mangoes will be ready for gathering. On the Downs, especially in the later districts, great care should be taken to stamp out the first appearance of the fruit fly, and the codlin moth should be systematically fought wherever it has made its appearance. It is no use to tie bandages round the trunks of the trees if the same are covered with rough bark, or if there are stakes standing alongside of the trees, as the larvæ of the moth will hide in the natural shelter of the rough bark and stake rather than in that of the bandage. First remove all possible hiding-places, and then place your bandages round the clean trunks, and you will trap the greater part of the larvæ as they leave the fruit.

The advice given in the December number of the *Journal* relating to the treatment of other fruit pests applies to the present month.

Keep the orchard well cultivated during the month—on the coast to keep down all weed growth as far as possible, and inland, in the dry districts, to retain as much moisture as possible in the soil. Where water is available, citrus trees growing in warm inland districts should receive a good irrigation during the month, taking care to follow the irrigation by a thorough cultivation, so as to prevent any baking of the soil, as well as to retain the moisture by preventing surface evaporation. Keep the nursery clean, look after all grafts or spring buds, and see that they are growing clean and straight, and, when the same are strong enough, head back to the height at which it is desired to form the head of the tree. Budding of all kinds of fruit trees can be done during the month, the only requisites to success being that the buds are fully developed, and that the back of the stock runs freely. For budding, use a very sharp knife, and see that you cut your buds thin. On no account remove the wood from the bud, as it only makes the operation slower, and does no good. The quicker budding is done the better, and the less the inner bark of the bud or stock is exposed the better will be the take. Always tie your buds firmly, especially so at the base of the bud, as it is there that the union must take place. As soon as the bud has taken properly, the ties should be cut, otherwise they are apt to cut into and destroy the stock. For full particulars of budding I will refer to the article dealing with this subject that has already appeared in this *Journal*. Mangoes can be grafted during the month, as described and illustrated in the present number of this *Journal*. When the weather is suitable—that is to say when it is cloudy, and the air is full of humidity, and the soil is thoroughly moist—this and the succeeding month is a good time to transplant tropical or semi-tropical fruit trees, such as the mango, as these trees transplant better now than during early spring. Citrus trees of all kinds can also be transplanted successfully. Pines and bananas can still be set out, though earlier planting is preferable, in order for the young plants to have become thoroughly established before winter.

Pulses for green-crop manuring, such as the cow pea, poor man's bean, and Small Mauritius bean, can be planted during the month in the coastal districts, as they make such a rapid growth during the rainy season that they are able to hold their own against weeds, and in many instances to keep weeds in check.

Farm Notes for January.

The principal work in the field during this month will consist in ploughing and preparing the land for future crops. Particular care should be given to destroying all weeds before they seed. This will save much cleaning afterwards. Maize may still be sown for a late crop. Sow sorghum, imphee, Cape barley, vetches, panicum or setaria, teosinte, rye, and cow peas, if the weather will permit. Early potatoes may be planted whole, but they must have plenty of room, or they will be drawn up; and in any case such early planting can only be looked upon as an experiment which may or may not be successful.

Garden Notes for January.

By H. W. GORRIE
Horticulturist, Queensland Agricultural College.

In hot dry weather, such as we usually have in January, there is not much that can be done in the way of gardening, unless an unlimited supply of water is at command.

The cultivator and hoe must be kept going constantly among the crops, so that as much benefit as possible may be obtained from what moisture there is in the ground.

Kitchen Garden.—A first sowing of cabbage, cauliflower, and Brussels sprouts may now be made in a covered seed bed, which must be kept well watered and carefully watched for insect pests. If these are sown in narrow, shallow drills, they will grow more sturdy, and be easier to transplant than if sown broadcast. Celery may be sown in a shallow, well-drained box, which must be shaded until the plants are well up. The box ought to be watered before the seed is sown rather than after sowing. Parsley, to keep up a supply, may be sown in the same way. French beans may be sown in favourable weather. Cucumbers, squashes, &c., should now be plentiful; the plants should be pegged down as they grow, and, if it is desired to prolong their bearing season as much as possible, none of the crop should be allowed to ripen, but all ought to be gathered when fit for use, whether they are wanted or not. If two or three cucumbers on a plant are allowed to mature, the plant will soon lose vitality, cease to bear, and die. Tomatoes, if not already attended to, should be staked up or supported in some way to keep them off the ground. Onions, if not already taken up, should now be ripe, and should be carefully lifted without bruising them, and stored in a cool airy shed. A few rows of beet root and carrots may be sown, but it is still too hot to plant the main crops of these.

In the Flower Garden, the work now chiefly consists of watering and hoeing. Roses may be budded this month, if it is desired to increase the stock of these most useful and beautiful plants. Dahlias and chrysanthemums must be tied up to stakes as they grow, and both will be greatly benefited by watering with liquid manure once or twice a week. Bouvardias are now in flower, and they also should be staked, and have a little weak liquid manure occasionally. All spent flowers of any kind should be cut off; by doing this, not only do the beds look better, but the flowering season of the plants will be lengthened; because a plant cannot mature seeds and keep on producing flowers at the same time. Coleus beds will now be at their best, and any plants which show a tendency to become straggling should be pinched back. Cuttings will grow now if stuck in the ground anyhow in showery weather, and advantage should be taken of favourable opportunities to fill up any blanks.

Public Announcements.

THE Editor will be glad to receive any papers of special merit which may be read at meetings of Agricultural and Pastoral Associations in Queensland, reserving, however, the right to decide whether their value and importance will justify their publication.

WE shall be pleased to receive reports of the progress of Butter and Cheese Factories and Creameries for publication.

THE *Queensland Agricultural Journal* will be supplied to all members of Agricultural and Horticultural Societies who do not derive their livelihood solely from the land, on payment, in advance, of an annual subscription of 5s.

GOVERNMENT AGRICULTURAL LABORATORY.

INSTRUCTION FOR THE COLLECTION OF SAMPLES, AND SCALE OF FEES.

GENERAL INSTRUCTIONS.

1. All analyses are carried out in their turn as they arrive at the Laboratory.

2. Should a customer wish for an immediate analysis, the fee, as provided by scale of fees below, will be increased by 50 per cent.

3. The samples may be forwarded by parcel post or by rail, either to the Under Secretary for Agriculture, Brisbane, or direct to the Chemist, Agricultural Laboratory, at the Agricultural College, Gatton; but in any case the required fee must be transmitted at the same time.

4. Analyses will be only carried out, if samples are taken strictly in accordance with the instructions issued below.

SCALE OF FEES.

	Farmers, Selectors, Gardeners. £	s.	d.
Soil—Short analysis (estimation of lime, alkalies, nitrogen, and phosphoric acid)	2	2	0
Soil and Subsoil—Short analysis	3	3	0
Soil—Complete analysis	4	4	0
Water—Analysis	3	3	0
Manures—			
Complete analysis	2	2	0
Nitrogen only	0	7	6
Potash only	0	7	6
Phosphoric acid sol.	0	15	0
Phosphoric acid insol.	0	15	0
Food Stuffs—			
Complete analysis	2	2	0
Water only	0	5	0
Albuminoids	0	10	0
Oil or fat	0	7	6
Ash	0	5	0
Fibre	0	7	6
Sugar-cane, sugar-beet, megass—Analysis of	1	1	0
Sugar, massecuite, jelly, molasses	1	1	0
Milk, butter, cheese—Complete analysis	1	0	0
Tanning materials (tannin estim.)	1	0	0
Soaps	1	10	0
Limestone, cement, clay, &c....	3	0	0

INSTRUCTIONS FOR TAKING AND COLLECTING OF SAMPLES.

SOILS AND SUBSOILS.

To obtain a fair average sample of the soil of a block of land, as near as possible, equal quantities of soil are taken from various parts of the fields.

A sketch plan of the field, paddock, or block of land on which the samples were taken should accompany the samples, and the spots where samples are taken are marked on this plan and numbered. This sketch plan should also indicate position of roads, creeks, gullies, ridges, general fall of the land, &c.

Should the soil in various parts of the block show a very marked difference, it will be necessary to divide the block into two, rarely in more, parts. Should the different soil occur only in a small patch, this sample may be left out.

Not less than three samples should be taken in each section. A greater number is to be preferred, as a better average will be obtained.

At the places chosen for the taking of the samples the surface is slightly scraped with a sharp tool, to remove any surface vegetation which has not as yet become part of the soil.

Vertical holes from 10 to 18 inches square are dug in the ground to a depth of 2 feet 6 inches to 3 feet.

The holes are dug out like post-holes; an earth-auger facilitates the operation considerably, and the holes may be trimmed with the spade afterwards.

Careful note of the appearance of the freshly cut soil and subsoil should be taken. The depth of the real soil, which in most cases is easily distinguished, is also measured and noted for each hole. Note how deep the roots of the surface vegetation reach into the soil. If the soil changes gradually into the subsoil, as is the case in some places where the soil is of very great depth, this line of division is guessed approximately, or it is best to take the soil uniformly to a depth of 12 inches.

With a spade a slice of soil is now cut off and put on to a clean bag. The same is done with the subsoil, and the slice is taken from where the soil ends (or 12 inches) to the bottom of the hole, and this subsoil placed on another bag. Stones over the size of a pea may be picked out, the rough quantity of such stones estimated, and a few enclosed with the samples. Fine roots must not be taken out from the soil samples. The same operation is repeated at the other places chosen. Careful note and description in each hole, as numbered and marked on plan given, and the samples of soil collected on the one bag thoroughly mixed by breaking up any large clods, and about 10 lb. of the mixture put into a clean canvas bag, which is securely tied up and labelled. The same is done with the samples of subsoil collected on the other bag.

All the samples collected are afterwards placed into a wooden box.

It is important to use clean bags and clean boxes, and also that the samples should not be left in the neighbourhood of stables or manure heaps. A short description of the land must accompany the samples and the sketch plan.

In the case of cultivated land, state how long the land was under cultivation, what crops were chiefly grown, result of such crops, was any manure applied, when, and what sort, and in what quantities per acre. In the case of virgin soil, state if the land was heavily timbered or not, ringbarked, if scrub or forest land, what sort of timber was chiefly growing on the land. In all cases a description of the neighbouring land, outcropping rocks, &c., are of great value. Also state if the land is naturally or artificially drained or not; describe the land as regards its position to hills, roads, creeks, ridges, &c. Only by adhering strictly to these instructions, and by giving minute details, benefit can be derived from the soil analyses.

WATER.

It is best to collect and forward samples of water for analysis in stoppered glass bottles, generally known as Winchester quarts.

The bottles have to be perfectly clean, and stoppers must fit well. Corks should be avoided, but if used must be new and well washed with the water before being used for closing the bottle.

When taking waters from taps, pumps, bores, the water has to be allowed to run for a while before taking the sample. When taking the water out of a well, pond, or river, the bottle is completely immersed, but care has to be taken not to disturb the mud or sediment at the bottom of the water. Before the sample is actually collected, the bottle is rinsed three times with the water, filling each time about one-third full. The bottle is then filled within about 1 inch from the top; the stopper is inserted and securely tied down with a clean piece of linen or calico.

The stopper must not be fastened or luted with sealing-wax, paste, plaster of paris, &c.

MANURES.

When taking samples of artificial manures out of bags, the sample must be taken from different bags and at different places of the bag and not only from the top, or the bags before being used are emptied on a heap and mixed up well and the sample then taken. About 1 to 2 lb. put into a clean bag should be forwarded for analysis.

FOOD STUFFS.

It is always important to obtain good average samples, and this can only be done by great care in taking the samples from different places, mixing well, and taking a small part of the mixture. This method would apply to any dry food-stuff—as grains of any kind, peas, beans, chaff, pollard, meal, &c. For the analysis of green foods—as green hay, sorghum, silage—it is best to make a mixture of the sample by passing it through a chaffcutter, and by taking an accurately weighed quantity—say 1 lb. This quantity may then be dried in the sun, taking care that nothing is lost, and when dry put in a bag and forwarded for analysis. The green samples may also be forwarded without drying in fruit-preserving jars.

To collect information about value of *green manures*, it is best to plot out exactly one square yard in the field covered with the plant, not picking out a position where the growth is very heavy or poor, but about a fair average. Four pegs are driven into the ground at the four corners, and string stretched between them; with a sharp spade all the plants are cut along the strings, so as to get really the growth of one square yard. The plants are all collected and accurately weighed, passed through a chaffcutter, and the sample for analysis taken as above described. In many cases the roots may be also pulled out, weighed separately, and a sample forwarded.

The samples have to be accompanied by a description of the crop—when planted, how old when cut, if the land was manured or not, weight of crop per acre or per square yard, and weight of the sample forwarded when in its green state. In the case of green manures it is generally best to take the samples at the same time when ploughed under, just after flowering.

By Authority: EDMUND GREGORY, Government Printer, William street, Brisbane.

Plate LXXXII.

TOBACCO GROWN WITH JADOO.

Agriculture.

WHEATS AT HERMITAGE STATE FARM.

By C. ROSS, Manager.

To describe in detail all the varieties that have been grown at the State farm is inexpedient in these few notes; but a description of a few of the stud plots and results attained may prove of interest. Before entering upon the description of the wheats, I would point to the conditions under which they were grown. The farm land is not by any means typical wheat soil, but rather the reverse. Many wiseacres in the district predicted failure, not only of wheat, but of other crops as well. To some small extent this prediction has been verified, as there are several patches of alkaline soil throughout the area comprising the farm, where it is impossible to germinate a grain of maize or wheat —in fact, even weeds are entirely absent. It therefore follows that the wheat fields during the past season presented a somewhat blotched appearance in consequence of these bald patches. To counteract the effects of these alkali belts, it is intended to carry out careful experiments with various simple chemical compounds, and records of results will be kept.

The area under cereals at the Hermitage harvested during the present season was upwards of 100 acres, which gave a total yield of wheat, 1,218 bushels; barley, 650 bushels; in addition to which there were forty plots of stud wheats ranging in area from half-an-acre to one-eighth of an acre; and 403 named sorts of wheats, which occupied in all an area of about 18 acres. Unfortunately, the site chosen both for the stud wheat and the nomenclature collection was intersected in various places by the alkali patches before mentioned; hence the results (although on the whole they may be considered satisfactory) are not all that could be desired.

As some of your readers may not understand the term "stud" as applied to wheats, I would point out that stud implies small areas of grain sown in rows, the seed being hand-selected heads from the previous year's crop. In hand selection every care is exercised that only pure seed is gathered, and, as a result of this, pure seed can be depended upon from the sowing, thus increasing the amount of grain for subsequent sowing. The forty plots at the Hermitage, being all hand-selected grain of last season, were of the varieties of wheat described in the table attached.

About 500 bushels of Marshall's No. 3 wheat, guaranteed pure, are available for seed purposes, and about 400 bushels of Chevalier barley, also of warranted purity. The Department, with a view to assisting the farmers to secure a first-class seed, are now prepared to receive orders for both Marshall's No. 3 and No. 8 and the barley mentioned, at the rate of 5s. per bushel free on board at the Hermitage State Farm. All orders for these seeds to be accompanied by post-office order or cheque for the amount; as the quantity for distribution is only very limited, applicants, to prevent disappointment, should apply early to the Under Secretary for Agriculture, Brisbane.

LIST OF WHEATS GROWN AT STATE FARM, HERMITAGE, DURING SEASON OF 1898.

Number.	Name of Wheat.	Height of Straw. ft.	Height of Straw. in.	Length of Ear. inches.	Condition of Straw.	Time of Maturing.	Degree of Rust.	Remarks on Grain, &c.
	GROUP POULARD, from 1 to 31—							
1	Egyptian E ...	2	8	$3\frac{1}{2}$	Slight flag ...	Early ...	Nil ...	Grain fair, rather pinched
2	Sicilian Baart ...	3	8	$3\frac{1}{2}$	do. ...	Middling	Slight rust ...	Fine full berry
3	Forella ...	3	6	$3\frac{1}{4}$	Much flag ...	,, ...	do. ...	A very pretty grain, but not full
4	Mica ...	3	8	4	Clean straw ...	,, ...	No rust ...	Small but plump grain
5	Medeah ...	5	0	$4\frac{1}{2}$	Strong and clean ...	,, ...	do. ...	A big coarse berry—this is a very ornamental wheat
6	Egyptian C 1 ...	3	0	$2\frac{1}{2}$	Slender, clean ...	Early ...	do. ...	Small clean-skinned berry, very unequal
7	Do. C 2 ...	3	0	3	Slender and clean ...	,, ...	do. ...	do. do. do.
8	Do. D ...	2	0	3	do. ...	,, ...	do. ...	Larger clean-skinned berry, very unequal
9	Do. A 1 ...	3	0	4	do. ...	,, ...	do. ...	do. do. do.
10	Do. A 2 ...	3	0	3	do. ...	,, ...	do. ...	Small clean-skinned berry, very unequal
11	Young's Bearded ...	3	6	$4\frac{1}{2}$	Strong straw ...	Middling	Slight rust ...	A very large number of small berries in every head
12	Paros ...	4	3	4	Clean straw ...	,, ...	do. ...	A fine-looking grain, but pinched
13	Atlanti ...	4	0	6	Very strong straw ...	Late ...	do. ...	A big coarse grain, with thick skin
14	Banater ...	3	6	4	Slender ...	Middling	No rust ...	Matures very slowly and fills badly
15	Cretan ...	3	9	4	Strong ...	,, ...	Rust ...	Plump and of even size (a tapioca wheat)
16	Belotourka ...	3	0	5	Slender ...	,, ...	Clean ...	Good grain, bright colour (a tapioca wheat)
17	Missogen ...	3	8	3	Strong flag ...	Late ...	Rust ...	Grain not well filled
18	Bearded Club ...	3	6	$2\frac{1}{2}$	Slender flag ...	Middling	do. ..	Short thick-set grain, but ears fill badly
19	Pugh's Rust Resisting ...	3	6	3	Hard straw ...	,, ...	Rusty ...	A fair grain, but a lot of waste in milling
20	Salvator ...	4	0	$4\frac{1}{2}$	Coarse flag ...	Late ...	do. ...	Not worth much as a grain
21	Hebron ...	4	0	$4\frac{1}{2}$	Coarse and flaggy ...	Middling	Slight rust ...	Grain moderate, very unequal
22	Hunter's White ...	3	9	$4\frac{1}{2}$	Fine straw, broad flag	,, ...	Clean ...	do. do.
23	Algerian ...	4	0	$4\frac{1}{2}$	Strong and hard ..	Late ...	Rusty ...	A very slow-filling grain, much pinched
24	White-eared Mummy ...	2	9	$4\frac{1}{2}$	Fair, but flaggy ...	Middling	Clean ...	A poor grain, a lot of waste
25	Brown do. ...	3	3	$4\frac{1}{2}$	do. ...	,, ...	do. ...	do. do.
26	Egyptian B ...	2	9	3	Short, slender, hard	,, ...	Some rust ...	A rather promising grain, of bright colour
27	Do. F ...	2	9	2	do. ...	,, ...	do. ...	do. do. do.
28	Australian Poulard ...	3	3	4	Coarse, with flag ...	Late ...	do. ...	A good-sized grain, but not well filled
29	Bancroft ...	3	3	$4\frac{1}{2}$	do. ...	,, ...	do. ...	Size fair, but lacks plumpness; very pinched
30	Egyptian H ...	2	6	$3\frac{1}{2}$	Slender, soft, no flag	Middling	No rust ...	Pretty round plump grain, colour bright
31	Laidley ...	2	10	3	Short, but fine; some flag	Late ...	Some rust ...	Not of much value, ears not well filled
	GROUP POLAND, 32—							
32	Poland ...	3	9	7	Strong and flaggy ...	Middling	No rust ...	This wheat is only adapted for ornament

	Group Heron, 33—							
33	Blue Heron	3	0	3	Fine straw, some flag	Late ...	No rust ...	Grain poor ; adapted only for growing as hay
	Group Bailey, 34—							
34	Bailey	2	6	4	Poor straw, hard ...	,, ...	Rusty ...	Poor, and very much pinched
	Group Riete Ladoga, from 35 to 49—							
35	Robert's	2	6	4	Slender and flaggy ..	Late ...	Very little rust...	Grain very poor
36	Rural New Yorker Rye Wheat	2	2	4	do. ...	,, ...	do. ...	do.
37	Diche Mediterranean	2	6	3	do. ...	,, ...	do. ...	do.
38	Ladoga	2	0	5	do. ...	,, ...	do. ...	do.
39	Hindustan	2	9	6	Fine, soft, and clean	Middling	do. ...	This grain promises well, and yields well
40	Tasmanian Red	2	6	4	Poor and flaggy ...	,, ...	do. ...	Very poor and thin
41	Lehigh	2	8	4	do. ...	,, ...	do. ...	A fair grain, but lacks plumpness ; dull colour
42	Brogan's Red and White ...	3	0	5½	do. ...	,, ...	do. ...	do. do. brighter colour
43	Gharaf	2	6	5	do. ...	,, ...	do. ...	This is the best grain in the Group
44	Anglo-Australian	2	0	6	do. ...	Late ...	Much rust ...	Very poor
45	Ironclad	2	6	6	do. ...	,, ...	do. ...	Moderate, but badly pinched
46	Rieti	2	9	4	do. ...	Middling	do. ...	A really good grain, bears well, and fills evenly
47	Ultuna Red Beard	2	0	4	do. ...	Late ...	do. ...	Very poor, badly shrunk
48	Bearded Red Autumn	2	0	4	do. ...	,, ...	No rust ...	Clean small grain, but very much pinched
49	Champlain	2	6	5	do. ...	,, ...	Slight rust ...	Big berry, but coarse
	Group Australian Bearded, 50—							
50	Port Germain	2	6	5	do. ...	,, ...	Rusty ...	A very poor grain
	Group Japanese, from 51 to 52—							
51	F1	2	6	3½	Very slender, free of flag	Early ...	None ...	A very pretty clear grain ; very plump, prolific
52	Early Japanese	2	3	4½	do.	,, ...	do. ...	do. do. do.
	Group Herrison, from 53 to 54—							
53	Sherman	2	6	3½	Weak, rather flaggy	Late ...	Rusty ...	A poor grain, and far too late for testing
54	Bearded Herrison	2	6	2	do.	,, ...	do. ...	do. do.
	Group Winter Nigger, from 55 to 57—							
55	Winter Nigger	2	3	4½	Very flaggy	,, ...	Very rusty ...	Grain of very poor quality
56	Rudy	2	2	6	do.	,, ...	do. ...	do. do.
57	Bearded Champion	2	0	6	do.	,, ...	Rusty ...	do. do.

List of Wheats grown at State Farm, Hermitage, during Season of 1898—*continued.*

Number.	Name of Wheat.	Height of Straw. ft.	Height of Straw. in.	Length of Ear. inches.	Condition of Straw.	Time of Maturing.	Degree of Rust.	Remarks on Grain, &c.
	Group Lazistan, from 58 to 80—							
58	Lazistan	2	3	5	Poor and very flaggy	Very late	Rusty ...	
59	Reliable	2	6	5	do.	" " ...	do. ...	
60	Penguin Island	2	3	5	do.	" " ...	do. ...	
61	Pringle's No. 5	2	0	5	do.	" " ...	do. ...	
62	Shelton's Russian	2	3	4	do.	" " ...	do. ...	
63	Frumente Ferrascense	2	3	5	do.	" " ...	do. ...	
64	Bearded Monarch	2	3	5	Fair, but coarse ...	" " ...	Slightly rusty ...	
65	Thuiss	2	3	5	Poor	" " ...	Rusty ...	
66	Deitz	2	6	4½	Poor and very flaggy	" " ...	Very rusty ...	
67	Fulcaster	2	3	3½	do.	" " ...	do. ...	
68	Miami Valley	2	6	3	do.	" " ...	do. ...	The grain is poor in all the Lazistan Group, and if success is to be attained a much earlier sowing must be made
69	New Red Wonder	2	0	4	do.	" " ...	do. ...	
70	Crate	2	3	3	do.	" " ...	Rusty ...	
71	Jasper	2	6	4	do.	" " ...	do. ...	
72	Saratow	2	6	7	do.	" " ...	Very rusty ...	
73	Rio-Grande	2	6	5	do.	" " ...	do. ...	
74	Mediterranean	2	0	3	do.	" " ...	do. ...	
75	Australian Amber	2	3	4	do.	" " ...	do. ...	
76	Soft Portuguese	2	6	4	do.	" " ...	do. ...	
77	Darblays Hungarian	2	0	3	do.	" " ...	do. ...	
78	Audriola Amber	2	3	5	do.	" " ...	do. ...	
79	Barbua gros grain	2	0	4	do.	" " ...	do. ...	
80	China Tea	2	6	5	do.	" " ...	do. ...	
	Group Beal, 81—							
81	Beal	2	3	4	Fair straw, flaggy ...	..	Slight rust ...	Long thin grain, badly pinched.
	Group Baart, from 82 to 95—							
82	Early Baart	2	9	5	Fine clean straw, hard	Early ...	Quite clean ...	A very promising wheat, which should do well in high land
83	Dutoits	2	6	5	do.	" ...	do. ...	do. do.
84	Quartz	2	9	5½	Very flaggy	Late ...	Rusty ...	Very poor grain
85	Early Bearded	2	6	4½	Fairly clean straw ...	Middling	Slight rust ...	A grain of some promise, plump, and well-formed
86	African	2	3	5	Flaggy and coarse ...	" ...	Rather rusty ...	A very second-rate grain
87	Archer's Prolific	2	9	5	Fine straw, erect ...	" ...	Slight rust ...	This grain is very similar to that of No. 85
88	Johnson	2	0	3	Poor straw	Late ...	Rusty ...	Not a success, heads filled badly
89	Democrat	2	0	3½	do.	" ..	do. ...	do. do.

90	Champlain's Hybrid	2	8	5½	Fair straw, very hard	Middling	Nearly free of rust	Next to Early Baart this is the best wheat in the Group
91	Uncle Tommy	2	6	6	Poor and coarse ...	Late ...	Very rusty ...	Not a success
92	Soft Algerian	2	3	5	do. ...	,, ...	do. ...	do.
93	Californian Genesee	2	0	4	do. ...	,, ...	do. ...	do.
94	Tall Bearded Neapolitan ...	3	3	6	A fine upstanding straw	Middling	Slight rust ...	This grain looks well, fills well, and berries very plump
95	Cythere White	2	6	5½	Moderate	,, ...	do. ...	A poor grain
	Group Bearded Indian, from 96 to 99—							
96	Canning Downs	3	0	4	Very weak straw ...	,, ...	Very little rust ...	A fair grain, but badly pinched
97	Gore's Indian, No. 2	2	9	4	do. ...	,, ...	do. ...	do. do.
98	Do. No. 1	2	9	4	do. ...	,, ...	do. ...	do. do.
99	Indian Clubbed	3	0	4	do. ...	,, ...	Rusty ...	Round berry of a plump character, but pinched
	Group Bearded Velvet, from 100 to 103—							
100	Bearded Velvet	2	0	3½	Poor and very flaggy	Late ...	Very rusty ...	Not a success
101	Andros	2	3	4½	do. ...	,, ...	do. ...	do.
102	Pride of Butte	2	5	5	Very much flag ...	,, ...	Rather rusty ...	do.
103	Cone Rivet	2	6	3½	do. ...	,, ...	do. ...	do.
	Group White Velvet Chaff, from 104 to 116—							
104	Velvet Chaff Red Grain... ...	2	6	4				
105	Old French Velvet	2	3	4				
106	White Velvet	2	6	4½				
107	Carter's 87	2	3	5				
108	Do. F	2	3	5½				
109	Tardent's Blue	3	3	6				
110	Carter's D	2	0	3	All very flaggy and coarse	Late ...	Very rusty ...	The whole of this Group is a partial failure; not a single variety has full ears; all formed grains are only half full. To ensure good results, earlier sowing must be gone in for
111	Canadian Velvet Chaff	2	3	4				
112	Brigg's RR	2	6	3				
113	Jones's Winter Fife	2	6	4				
114	Velvet New Zealand	2	9	3				
115	Basalt	2	9	5				
116	Langfeldts	2	9	3				
	Group Velvet Pearl, from 117 to 120—							
117	Velvet Pearl	3	3	4½	Rather inclined to flag	Middling	Very little rust...	A wheat which may be improved; fine grain
118	Indian Fife	2	9	4	Slight flag	,, ...	None	A superior grain, bright colour and plump berry
119	Carter's 43	2	3	3	Very poor	Late ...	Very rusty ...	No good
120	Rye Wheat	3	0	5	Very flaggy	Late ...	Rusty ..	Partial failure

LIST OF WHEATS GROWN AT STATE FARM, HERMITAGE, DURING SEASON OF 1898—*continued.*

Number.	Name of Wheat.	Height of Straw.		Length of Ear.	Condition of Straw.	Time of Maturing.	Degree of Rust.	Remarks on Grain, &c.
		ft.	in.	inches.				
	GROUP INDIAN, from 121 to 126—							
121	Indian Early	2	6	5	All quite clean, bright straw, except 124, which is very rusty and full of flag	...	No rust ...	The grains in this Group are all very uniform in shape and size, except No. 124, which is very inferior. Indian wheats stand drought much better than most other varieties
122	Do. F	2	6	3½		...	do. ...	
123	Do. Z	2	6	3½		...	do. ...	
124	Carter's 81	2	6	6		...	Rusty ...	
125	Early Para	2	9	5		Middling	No rust ..	
126	King's Jubilee	2	9	5½		" ...	do. ...	
	GROUP STEINWEDEL, from 127 to 128—							
127	Pride of Barossa	2	9	5	Coarse and flaggy ...	" ...	Very rusty ...	Grain very much pinched
128	Steinwedel	4	0	4	Coarse, but not so flaggy	" ...	Part rusty ...	do. do.
	GROUP PURPLE STRAW, from 129 to 141—							
129	Rattling Jack	2	3	3¾	Very little flag; erect	" ...	Rust on flag ...	A good plump grain, but slow filling
130	Fountain	2	6	6	Full flag ...	Late ...	Rusty ...	Grain poor
131	The Blount	3	0	5	do. ...	" ...	do. ...	do.
132	Northern Champion	2	9	5¼	do. ...	" ...	do. ...	do.
133	Italian Tuscan	3	0	5	Strong straw, bottom flag	Middling	Rust on flag only	A fair grain; good full ears
134	Farmer's Friend	3	0	5	Poor straw; coarse ...	Late ...	Rusty ..	Very moderate; badly pinched
135	Fillbag	3	0	4½	Good, clean, and strong	Middling	Very little rust ...	A good grain; very prolific, berry well filled
136	Rattling Tom	2	0	4½	Weak straw, flaggy ...	Late ...	Rusty ...	Round plump grain, matures slowly
137	Red Straw	3	0	5	Coarse and flaggy ...	" ...	do. ...	Grain poor; badly pinched
138	Hudson's Early	3	0	4	Erect, clean, no flag..	Middling	Slight rust ..	Fair grain, but pinched
139	Jacinth	3	0	5	Clean, no flag ...	" ...	Very little rust ...	A good well-developed grain, promises well
140	Australian Glory	2	9	4	Fine, erect, clean ...	" ...	do. ...	A wheat of great promise, well filled
141	Steer's Early	2	9	4	do. ...	" ...	Slight rust ...	A small grain, but well filled and plump
	GROUP TUSCAN, from 142 to 154—							
142	Battlefield	3	0	5	A fine upstanding straw	Early ...	Very little rust ...	Very handsome grain; rather pinched
143	White Tuscan.	2	0	4½	A fair straw, slight flag	Middling	Rusty ...	Moderate grain; very pinched
144	Tuscan, Early	2	6	5	A poor straw, flaggy	Late ...	Very rusty ...	do. do.

145	Tuscan Red	2	9	5	do. ...	” ...	do. ...	do. do.
146	Do. Purple Straw	2	6	$4\frac{1}{2}$	do. ...	” ...	do. ...	do. do.
147	Californian Chili	2	9	5	A clear, bright straw	Middling	No rust ...	The best grain in the Group, plump
148	Oaksholtz's Champion	2	9	$5\frac{1}{2}$	Poor, badly developed	Late ..	Rather rusty ...	Poor
149	Blue Straw	2	9	4	Short, thick, and very flaggy	” ...	Rusty ...	do.
150	District	3	6	$4\frac{1}{2}$	do. ...	” ...	do. ...	do.
151	Agate	2	6	$4\frac{1}{2}$	do. ...	” ...	do. ...	do.
152	American Purple Straw	2	3	4	do. ...	” ...	do. ...	do.
153	Carter's E	2	3	$3\frac{3}{4}$	Very short set ...	” ...	do. ..	do.
154	Do. B	2	0	$3\frac{1}{2}$	do. ...	” ...	do. ...	do.
	Group Lammas, from 155 to 175—							
155	Bordier	2	6	5	All very flaggy, except Nos. 157, 158, 166, 167; these four are fairly clean straw; all erect growers	Late ..	All the Group more or less affected with rust	All the Group has produced very poor, pinched, and badly-matured grain, with the exception of Nos. 157, 158, 166, and 167; these are very fair berries, especially those of Young's White. The whole of the Lammas Group might produce better results had the wheats been grown on more favourable soil, the land being full of alkali
156	Hunter's White	3	0	6		” ...		
157	Lake Bathurst	3	0	6		Middling		
158	White Naples	2	6	3		” ...		
159	Do. Flanders	3	0	5		Late ...		
160	Chiddam	3	0	$4\frac{1}{2}$		” ...		
161	White Essex	2	0	$4\frac{1}{2}$		” ...		
162	Landreth's Hard Winter ...	2	9	$4\frac{1}{2}$		” ...		
163	Green Mountain	2	9	4		” ...		
164	Dallas	3	0	4		” ...		
165	Leak's RR	2	6	$4\frac{1}{2}$		” ...		
166	White Lammas (Young) ...	3	6	5		Middling		
167	Australian Talavera	3	0	5		” ...		
168	Snowball	3	0	$5\frac{1}{2}$		” ...		
169	Talavera de Bellevue	2	6	$5\frac{1}{2}$		Late ...		
170	Zealand	2	0	$6\frac{1}{4}$		” ...		
171	Mammoth	3	0	$6\frac{1}{2}$		” ...		
172	Carter's 103	2	0	$3\frac{1}{2}$		” ...		
173	Purple Vermont	2	6	$3\frac{1}{2}$		” ...		
174	Prope	2	6	5		” ...		
175	Chrysolite	3	3	4		” ...		
	Group Essex, from 176 to 183—							
176	Port McDonald	3	0	5	All flaggy, except 176 and 182, both of which have fairly clean straw	Middling	All very rusty, 176 and 182 being the exception	Grain all very poor, badly pinched, the only exception being 182, which is a promising grain
177	White Essex	2	9	$4\frac{1}{4}$		Late ...		
178	Tuscan do.	2	6	$4\frac{3}{4}$		” ...		
179	Frampton	2	0	4		” ...		
180	Chiddam's White Spring ...	2	3	4		” ..		
181	Martin's Amber	2	3	3		” ...		
182	Soft Australian	3	0	5		Middling		
183	Gneiss	3	0	$5\frac{1}{2}$		Late ...		

List of Wheats grown at State Farm, Hermitage, during Season of 1898—*continued.*

Number.	Name of Wheat.	Height of Straw.		Length of Ear.	Condition of Straw.	Time of Maturing.	Degree of Rust.	Remarks on Grain, &c.
		ft.	in.	inches.				
	Group White Club, from 184 to 188—							
184	Schilf	2	3	3	All poor straw, except 185, which is a slender, weak straw	Late ...	All rusty except that of 185	All poor grain
185	Fort Collins	2	9	$2\frac{3}{4}$		Middling		
186	Oregon White Club	2	6	3		Late ...		
187	Hedgrow	2	6	$2\frac{1}{2}$		" ...		
188	Little Club	2	6	$2\frac{1}{2}$		" ...		
	Group Noe, from 189 to 211—							
189	Zimmerman	2	9	$5\frac{1}{2}$	Fine clean straw ...	Middling	Slight rust ...	A fair grain; might give good results in good soil
190	Sardius	2	9	5	do. ...	" ...	do. ...	do. do. do.
191	Saumur Club	2	6	3	...	Late ...	Very rusty ...	Failure
192	High Grade...	2	3	$2\frac{3}{4}$	...	" ...	do. ..	do.
193	Manitoba	2	9	4	The whole of the "Noe" straws are poor, being flinty and thick, and all are very flaggy	All are Late wheats, except 189, 190, 193, and 203, which are Middling season	All are more or less rusty	The Noe Group, as a whole, are very disappointing as regards grain-producing wheats, but it is scarcely fair to condemn them on the present trial, as all were growing in soil very largely impregnated with alkali
194	Longberry	2	3	4				
195	Prince Edward Island	2	3	5				
196	German Beardless March ..	2	3	...				
197	Mouton	1	9	4				
198	China Spring	2	6	5				
199	Buckley's RR	2	6	4				
200	Blount's Fife	2	3	4				
201	Uttoba	2	6	5				
202	Pictet	2	6	6				
203	Red Nott	3	0	5				
204	Blount's RR	3	0	4				
205	Fultz	2	9	5				
206	Noe	2	3	4				
207	Crepi	1	9	$2\frac{1}{2}$				
208	Bladette Paylanreuse	2	3	3				
209	Saumur de Mars	2	3	4				
210	North Carolina	2	6	4				
211	Autumn Saumur	2	6	3				

	Group Fife, from 212 to 253—						
212	Small's OK	2	3	3			
213	Anderson's RR	2	9	4	A fair straw, erect ...	Middling	A little rust ...	A fair grain of fine appearance, but pinched
214	King's RR	2	9	3				
215	Niagara	2	9	3				
216	Sorrel	2	9	4½	Clear golden ; no flag	Middling	No rust	A fine bold grain, soft and plump, well filled
217	White Chaff Red	2	0	2½				
218	Improved Rice	2	3	4				
219	Scotch Red	2	0	3¾				
220	Russian	2	0	4				
221	Ontario Wonder	2	0	3½				
222	Smooth Red Spring	2	6	5				
223	Saskatchewan	2	0	3				
224	Scotch Fife	1	9	3				
225	Finley	2	0	3¼				
226	Inglis RR	2	0	3				
227	Count Waldersdorff	1	9	3				
228	Nimitybelle	2	0	4				
229	Canadian Club	2	0	3½				
230	Carter's B	2	0	3				
231	Amethyst	2	0	3				
232	Gallican Saumur	2	5	4				
233	Dominion	1	3	4				
234	Red Lorrain	2	0	3½				
235	Sardonyx	2	0	4				
236	Kaiser	0	6	No ear				
237	Sapphire	2	9	4½				
238	Indian Y	2	0	3½				
239	Do. D	2	0	3	Fine thin straw ; no flag	Middling	Signs of rust ...	A very pretty, clear berry ; plump, not pinched
240	Webb's Challenge	1	6	3				
241	Eclipse	0	6	No ear				
242	Hornblende	1	6	3				
243	Jock	2	0	3				
244	Porcelaine	2	0	3				
245	Trap	2	3	4	Stiff straw, with flag	Middling	Some rust ...	A very promising grain, but rather shy filler. Note.—All the other varieties in the Fife Group are more or less of little value. Some are entirely useless ; all are very late-maturing sorts ; consequently are very rusty. An early sowing might give better results
246	Ruby	2	0	4				
247	Wright's RR	2	0	3				
248	Feldspar	2	0	3				
249	White Russian	2	3	5				
250	Do. Fife	2	3	6				
251	Adamant	2	3	4½				
252	Flourspar	2	3	3				
253	Improved Fife	2	6	3½				

LIST OF WHEATS GROWN AT STATE FARM, HERMITAGE, DURING SEASON OF 1898—*continued.*

Number.	Name of Wheat.	Height of Straw. ft. in.	Length of Ear. inches.	Condition of Straw.	Time of Maturing.	Degree of Rust.	Remarks on Grain, &c.
	GROUP DEFIANCE, from 254 to 269—						
254	Clark's RR	2 9	4	All very flaggy ...	Late ...	All very rusty ...	This Group being sown in an alkali patch, the results have been the reverse of satisfactory. All the plants did not germinate, and those that did grow cannot be taken as a fair test of the value of the Defiance wheats
255	Beryl...	2 9	4				
256	Pringle's No. 5	2 0	5				
257	Australian RR	2 6	4				
258	Thomas' RR	2 3	4				
259	Leake's Defiance	2 3	5				
260	Pringle's do.	2 0	4				
261	Russian	2 3	4				
262	Pearl or Velvet	2 9	2½				
263	Murray River	2 6	3				
264	Defiance	2 9	4½				
265	Bega	2 0	4				
266	A	2 9	5				
267	Little Wonder	2 3	4				
268	Inglis' Success	Dead	No ear				
269	Blount's Lambrigg	2 0	4				
	GROUP GOLDEN DROP, from 270 to 279—						
270	Trump	1 3	2¼	All very flaggy, coarse and stunted	Very late...	Very rusty ..	The Golden Drop Group are altogether of too late a character for the heavy downs lands. None of those listed have matured any grain
271	Carter's K	1 6	2½				
272	Do. H	1 6	4				
273	Carter's 107	1 6	2¼				
274	Pringle's No. 6	1 9	4				
275	Opal	2 3	3				
276	Hallett's Pedigree	1 9	3				
277	Goldsmith's Pedigree	2 6	4¾				
278	Carter's New Hybrid	2 0	4				
279	Golden Drop	2 2	4				
	GROUP SQUAREHEAD, from 280 to 296—						
280	Bersler's Club	1 9	2	All varieties are very flaggy, and in most instances no straw	All very late	All very rusty .	This Group has done badly, but the quality of the soil in which they grew was not such as to warrant success, alkali being present in large quantity
281	Scholey's Squarehead	2 9	2				
282	Bestehorn's Dividend	1 6	No ear				
283	Emerald	2 9	4				

284	Red Altkirche	2	3	2½				
285	Majorica Carusa	1	9	2				
286	Webb's King Red	1	9	2				
287	Carter's A	1	3	1¾				
288	Do. C	1	6	2				
289	Dwarf Humboldts	1	0	No ear				
290	Ble a epicarre	2	0	2	do. do.	do.	do.	do. do. do.
291	Red Chaff	1	0	2				
292	Sicilian	2	0	2				
293	Four-rowed Sheriff	2	0	2				
294	Rimpan	2	3	3				
295	Carter's G	1	6	No ear				
296	Mould's Red	2	3	2				
	Group Allora Spring, from 297 to 301—							
297	Clubbed Indian	2	6	3	Slender, poor, and flaggy	Middling	Rusty	
298	Indian D	2	6	3	Clean, bright straw	,,	Slight rust	All this Group did well, and produced some very pretty grains; 298 is a wheat of great promise as regards the grain, but the straw is very brittle; 299A also possesses merit as a wheat, the berry being well formed
299	Budd's Early	2	9	5	Good, clean straw	Early to Middling	do.	
299A	Vennings	2	9	5	Fine erect straw	,,	do.	
300	Allora Spring	3	3	5	Fine, erect; some flag	,,	Rather rusty	
301	Odessa sans barbe	3	3	4	Handsome looking straw	Middling	do.	
	Group Ward's Prolific, from 302 to 315—							
302	Golden Prolific	1	6	No ear	Failure	Very late	Very rusty	
303	Australian Wonder	3	0	4	Fine erect straw	Middling	Very little rust	Grain fair, but slightly pinched
304	Marshall's No. 3	3	6	6	do.	,,	Free from rust	Excellent grain; very prolific; does not shed easily
305	Do. No. 8	2	8	6	do.	,,	do.	do. do. do.
306	Do. No. 10	2	6	6	Straw not so good	,,	Slight rust	Good, but smaller; very prolific; does not shed easily
307	Do. No. 2	3	0	5¾	Straw coarse; some flag	,,	do.	Fair grain, but badly pinched
308	Ward's Prolific	3	0	5	Fine clean straw	,,	Rust on lower flag	A good all-round grain; good harvesting grain
309	Hercules	3	0	3½	Straw rather coarse	Late	Rust on flag	Rather a handsome wheat, berry plump, well filled in ear
310	Red Clawson	3	3	4½	do.	,,	do.	A wheat that might do better in the more upland tracks
311	Ward's White	2	6	4½	Poor, weak straw	,,	Rather rusty	A poor grain, and very badly pinched
312	Marshall's No. 5	2	9	4½	Fair straw, flaggy	,,	do.	A very moderate grain
313	Roussillon	3	0	4	Coarse, flaggy	,,	Rusty	do. do.
314	Robins' RR	3	0	6	do.	,,	do.	do. do.
315	Currell	2	6	4	do.	,,	do.	do. do.

LIST OF WHEATS GROWN AT STATE FARM, HERMITAGE, DURING SEASON OF 1898—*continued*.

Number.	Name of Wheat.	Height of Straw. ft.	in.	Length of Ear. inches.	Condition of Straw.	Time of Maturing.	Degree of Rust.	Remarks on Grain, &c.
	GROUP RED PROVINCE, from 316 to 326—							
316	Odessa	2	9	5				
317	Red Bordeaux	3	0	5				
318	Pool	2	6	4½				
319	Clawson	2	6	3				
320	Prince Albert	2	0	3				
321	Red Province	2	9	3½	Very poor ...	Lato ...	Very rusty ...	No grain ; all the Group is a failure
322	Willett's	2	6	3				
323	Spaulding's Prolific	3	0	3				
324	Banham's Borwick	2	0	2				
325	Red Russian	2	0	2				
326	McGhee's White	2	6	2½				
	GROUP RYE WHEAT, from 327 to 332—							
327	Rural New Yorker	2	6	3	Fair straw	Late ...	Rusty	A very poor grain
328	German Emperor	3	0	4	Coarse	,, ...	do.	do.
329	Rye Wheat	2	6	3	Flaggy	,, ...	do.	do.
330	Early Genesee	2	6	3	Clean straw	,,	Slight rust ...	do.
331	Stewart	2	0	3	Very flaggy	,, ...	Very rusty ...	do.
332	Rye Wheat for Grains	2	9	4	Thin and flaggy ...	,, ...	do.	do.
	GROUP TUSCAN ISLAND, 333—							
333	Tuscan Island	2	6	3	Good straw	La'e ..	Rather rusty ..	A very indifferent grain
	GROUP SHELTON, from 334 to 341—							
334	Minnesota	2	6	4	Poor	Late ...	Very rusty ...	Grain no good, badly filled
335	Red Tenterfield	2	6	3	do.	,, ...	do. ...	do. do.
336	White Tenterfield	2	8	4	do.	,, ...	do. ...	A fair grain, badly filled on account of soil
337	Power's Fife	3	0	3	do.	,, ..	Slight rust ...	A moderate grain, pinched
338	F 1 (Cobb 51)	2	6	3	Good, clean	Very early	No rust ...	A small grain, very plump and prolific
339	Gayndah	2	9	6	Bright clear straw ...	,, ..	do.	A very pretty grain, well filled
340	Do. B	2	6	5	do.	Early ...	do.	do. do.
341	Yandilla	3	5	5	do.	,, ...	do.	do. do.

	GROUP FARRAR CROSSBRED WHEATS, from 342 to 391—							
342	140 GY	2	0	4	Rather much flag	Early	Signs of rust	A very fine grain ; slightly pinched
343	86 D	3	0	5	do.	,,	do.	do. do.
344	Ibis	3	6	5	do.	,,	do.	do. do
345	R	3	6	5	do.	,,	do.	do. do.
346	R1	3	6	5	do.	,,	do.	do. do.
347	Best Strain	3	6	5	Nearly clean	Middling	Rusty	Grain very much pinched
348	CD1 85	3	0	5	...	...	...	All these wheats from 348 to 360 are similar to No. 347
349	84 BY	3	3	4	...	...	...	
350	85 BY, 86 A1	3	0	4	...	...	...	
351	85 B2, 86 A1	3	0	5	...	...	...	
352	85 A1, B1	2	9	4	...	...	...	
353	85 A, B	3	0	4	...	...	...	
354	86 Y	3	0	5	...	...	...	
355	85 D2	3	6	4	...	...	...	
356	84 C1D	3	3	5	...	...	...	
357	84 C1D best	3	4	5	...	...	...	
358	Bald Canning Downs	3	3	4	...	...	...	
359	Buxar Soft White	3	0	4	...	...	...	
360	Nagar Red	3	3	4	...	...	...	
361	Bald Terozopore	3	6	3	Clear and bright	Middling	A little rust	A very fine-looking grain, but rather soft
362	Do. do. White	3	6	4	do.	,,	do.	do. do.
363	Petsi Exdam	2	10	4	Slight flag	Early	No rust	All very good grain and fairly prolific; a good dea is, however, slightly pinched, for which the dry season is no doubt mainly responsible
364	Do. 2	2	8	5	do.	,,	do.	
365	Moultan Hard	3	6	4	Very flaggy	Middling	do.	
366	1	2	6	4	do.	,,	do.	
367	2	3	0	4	do.	,,	A little rust	
368	Yandilla 1	3	0	4	No flag	,,	do.	
369	Do. 2	2	8	4	do.	,,	do.	
370	Do. 3	3	0	5	do.	,,	do.	
371	Kestrel	3	0	5	Much flag	Late	do.	
372	Do. 1	3	6	5	do.	Middling	do.	
373	Do. 2	3	3	4	do.	,,	do.	
374	Hayrick	3	0	4	Clean	,,	No rust	
375	Do. X	3	0	5	do.	,,	do.	
376	Carbine	3	0	5	do.	,,	do.	
377	Maffra	3	0	4	do.	,,	do.	
378	Ruskin	3	3	5	A very large flag	Late	Rusty	
379	Forest	3	0	4	Slight flag	Early	do.	
380	Sweetheart	3	0	5	do.	,,	do.	
381	Kirby	3	0	4	do.	,,	do.	
382	Warren	2	9	4	Very flaggy	Late	do.	
383	Comeback	2	10	4	Clean	Early	No rust	
384	Carslyle	3	0	4	A little flag	,,	do.	

LIST OF WHEATS GROWN AT STATE FARM, HERMITAGE, DURING SEASON OF 1898—*continued.*

Number.	Name of Wheat.	Height of Straw. ft.	Height of Straw. in.	Length of Ear. inches.	Condition of Straw.	Time of Maturing.	Degree of Rust.	Remarks on Grain, &c.
	GROUP FARRAR CROSSBRED WHEATS —*continued.*							
385	Tazar	3	0	4	Flaggy	Middling	Rust ...	A fair grain
386	Jonathan	2	6	5	Slight flag	,, ...	No rust ...	Ears badly filled, but grain good
387	Aspen	3	3	5	No flag	,, ...	Slight rust ...	do. do.
388	Eden	3	0	4	Much flag	Late ...	do. ...	do. do.
389	Do. 1	3	0	4	Flaggy	,, ...	do. ...	A fair, good grain, but pinched
390	Hermit	2	6	4	Very flaggy	,, ...	do. ...	do. do.
391	Yandilla Improved Indian ...	3	0	5	No flag	Early ...	No rust ...	do. do.
	MISCELLANEOUS WHEATS, from 392 to 403—							
392	Windsor Forest	2	0	Ears of grain not matured.	All very flaggy from 392 to 402.	All very late from 392 to 402	All very rusty from 392 to 402	No grain from 392 to 402. Not a single plant matured, although sown at same time as the Farrar Wheats
393	New White Queen	2	0					
394	Selected Square Head	2	0					
395	Challenge White	2	0					
396	April Red	2	0					
397	White Nursery	2	0					
398	Red Nursery	2	0					
399	Talavera	2	0					
400	Velvet Pearl (Tilley)	2	0					
401	Gallants' Hybrid	2	0					
402	? (Lewis)	2	0					
403	Selected (Armstrong)	3	0	6	Very little flag	Early ...	No rust ...	A very fine, clean well-matured grain
	GROUP BARLEY, from 404 to 408—							
404	Chevalier Barley (old)	2	3	5	Lot of flag	Early ...	Slight rust on bottom flag	A really very pretty barley
405	Do. do. (Archer's) ...	2	3	4½	do. ...	,, ...	do. ...	A good grain, but rather pinched
406	Chilian Barley	2	0	4	do. ...	Middling	No rust ...	A fair grain
407	Barley, Tilley	2	0	4	do. ...	,, ...	Rusty on flag ...	A fair, good grain, but pinched
408	Sea of Azof	2	0	4½	Very flaggy	,, ...	Rust on straw ...	A very promising barley ; very plump

WHEAT AND MAIZE IN THE CENTRAL DISTRICTS.

We have received from Mr. S. Hannay, of Hamlet Downs, Geera, Central district (N.), two samples of wheat grown by him on his farm on the Central Railway line. We have submitted the samples to expert examination, and the verdict is that both are excellent milling wheats, and exhibit a fulness of grain, lightness of bran, and gluten content which are remarkable considering the circumstances under which the grain was sown. In his letter Mr. Hannay says:—

I take the liberty of sending you two samples of wheat, also of maize,* grown on my holding. I send you these simply because of the place and soil and conditions under which they have been raised. Firstly, I may tell you, the land is what is known as "desert country"—in other words, sand. The crops were raised by irrigation solely. Not a drop of rain fell between seed-time and harvest, and the maize had the additional disadvantage of being severely attacked by grubs as soon as it appeared over ground. Again, the frost cut it down, but it came on again, and the cobs I send you are about the average of a crop of two acres which I have not yet threshed. I sowed it on 23rd July, and pulled it on 20th December. I may say that, so far as tillage was concerned, I broke up the land about 4 inches deep, cross-ploughed it at once at the same depth, and planted the corn in every fourth furrow—*i.e.*, 4 feet apart and 18 inches in the drill. The land was irrigated previous to breaking up. I only irrigated it once after planting, and that was when it was cobbing. I irrigate by drains 60 feet apart, and the water percolates through in three days. The water is then shut off. The maize grew to a height of from 9 and 10 feet, and a strange thing is that small plants, not more than 3 feet 6 inches high, bore as good cobs as any of the tallest. There are two different varieties, as you will see, and one matures much better than the other. I would like these samples named if you can do it, for evidently the long grain is not adapted to the conditions of irrigation. It is quite possible, however, that other causes have to do with it, as I have learned several points about the culture and irrigation of the crop here, which I shall put into practice in the coming season. It is my opinion that giving the land a good irrigating before working and by ploughing deep, say 8 inches, and sowing at the same depth, that no further watering will be required. There is a subsoil here about 1 foot below the surface, and the growth is there also. It retains the moisture, whilst at the same time it is sufficiently absorptive to admit of good natural drainage. As to the samples of wheat, the dark-coloured heads are Allora Spring, grown under the same conditions as the maize. The wheat crop never saw a drop of rain. The white heads were picked out of the field, and I would like the variety named if you can do it. The wheat was sown dry on 1st July, and reaped in October. I have not threshed it yet, but I think it will run to four bags on the one acre planted.

The sowing was late, but I had not my bore completed until the end of June, and I merely threw it in just to see if it would grow, and I am so satisfied with the result that I am planting 10 or 15 acres this season, and have just landed a four-furrow plough to begin work. I had also 2 acres oats which turned out well, although it was late. However, this all served as an experiment with a view to future operations. I had also a very nice crop of English potatoes ($\frac{1}{4}$ acre). I may say, in conclusion, I intend to go in largely for farming here, generally, and any seeds the Department may have to distribute for experimental purposes I shall be glad to give the best attention to. These samples, I may say, have a special interest in so far as they have been reared upon land hitherto supposed to be entirely useless, and, again, being reared without rain, which is the great factor in the experiment. It also leads to the supposition of a great future before this district, where there is a large area of such land as mine—easily worked, easily irrigated, and artesian water easily got. With practical men, I predict a great future for it. I may tell you that I am not a newchum at farming, having been reared at farming, and still have a farm at Pittsworth, Darling Downs.

* We regret that the samples of maize have not yet reached us.—Ed. *Q.A.J.*

We are much indebted to Mr. Hannay for his letter, and shall always be pleased to receive such interesting and valued communications from practical farmers, who are pioneering the farming industry in so many diverse parts of the colony, and following the high road to success often under the most disheartening circumstances. The fact that such cereals as Mr. Hannay sends us can be grown without receiving a single shower of rain from the date of sowing to that of harvesting on desert country serves to emphasise the fact that science in agriculture has become an absolute necessity, and will triumphantly disprove many statements made by pessimists as to the unsuitability of this or that district or soil for various crops.

Of the two varieties of wheat, one is Allora Spring and the other appears to be Defiance. As will be seen by a reference to the List of Stud Wheats grown this season at the Hermitage Experiment Farm, near Warwick, seed of both these varieties can be supplied at 5s. per bushel.

MARKET GARDENING, No. 3.

By H. W. GORRIE,
Horticulturist, Queensland Agricultural College.

CABBAGE AND CAULIFLOWER.

ALL the forms of our cultivated cabbages have originated from a small, wild biennial plant something like a mustard plant, which is found on the coasts of most of the countries of Western Europe, but chiefly on the northern shores of the Mediterranean.

This plant is *Brassica oleracea*, the wild cabbage; and it is the original parent of all our many varieties of cabbages, cauliflowers, Brussels sprouts, and, in fact, of most of the cultivated plants included in the cabbage family.

The evolution of all these varied plants, some of which are of very great excellence, from this little wild cabbage, is a striking example of what can be accomplished by means of cultivation.

Most of our cultivated fruits and vegetables have originated in much the same way from comparatively worthless beginnings, and have been brought to their present state by many years of intelligent cultivation. Of course it takes a long time to produce all these changes, and hundreds of years have elapsed since some of these wild forms were first taken in hand and cultivated by man.

The wild cabbage has no solid head such as we are accustomed to see in garden cabbages, but the stems and leaves are tender and succulent, and have been used as food from the earliest ages.

It is supposed that the cultivated cabbage has been grown for at least 3,000 years.

Pliny mentions six varieties as being known in his day. These, however, were not the hard-headed, compact cabbages with which we are now familiar, but merely improved varieties of the wild cabbage without hearts.

The first mention we have on record of the modern headed cabbage occurs in the year 1536, when mention is made of cabbages with heads a foot in diameter. About the same time, too, cauliflower and broccoli were first known. In the year 1574 the traveller Rauwolf found cauliflowers cultivated in Turkey and Cyprus, and from the latter place cauliflowers were first introduced into England under the name of "Cyprus coleworts." In Egypt cauliflowers have been grown from a very early period. In 1619 occurs the first record of cauliflowers having been sold in London. They were imported at that time from Cyprus, but very shortly afterwards France began to grow and export them to London.

Very soon, however, the English gardeners took to growing cauliflowers themselves, and by the middle of the eighteenth century better and larger cauliflowers were produced in England than in any other part of Europe, and

the industry grew so rapidly that in a very short time England began to export large quantities of cauliflowers to Germany, France, and Holland. These countries at the present day grow their own supplies, and export to England in their turn.

The many different varieties of cabbages and cauliflowers now in cultivation are of comparatively recent origin. At first the only distinction known was the division into early and late varieties, which division was brought about by saving the seeds from the earliest and latest plants to mature, and by again sowing these early and late the next season to gradually increase the difference in the time of maturing. By continuing this process, the length of time between early and late soon became considerable, and gradually other differences became apparent from climatic and other causes, until the two sorts became quite distinct. These, again, from being grown in different localities, in various kinds of soils, and by various modes of treatment, developed in time into still more distinct varieties, which, by cross-fertilisation, led to still more varied forms being obtained, until, at the present day, there are about 200 kinds of cabbages and 100 varieties of cauliflowers known. Some of these are comparatively worthless, and some are merely the same kinds under different names; but still a very large number of distinct varieties is now in cultivation.

So much for the history of the cabbage and cauliflower. Now to come to the practical part, which is—how to grow them. I know dozens of farmers who purchase vegetables from Chinamen, so it is fair to conclude that they do not know how to grow them themselves. Assuming this to be true, it will not be amiss to tell them something about how to grow good, wholesome cabbage and cauliflower.

THE CABBAGE.

Cabbages can be grown successfully in all the colder parts of Queensland, and also in the moderately warm districts. The chief requirements of the crop are rich soil, plenty of water, and thorough cultivation. Poor soil will not grow cabbages, so, if not naturally rich, it must be made so by working a liberal amount of stable and cowyard manure into the ground. The soil ought to be ploughed deeply, and thoroughly stirred up, so that the roots can penetrate in search of food and moisture. The first operation is to prepare a seed bed in the manner already described; sow the seed in little drills half an inch deep and six inches apart, and cover lightly with rotten manure or very fine soil. Do not sow deeply; if the seed is merely sown on the surface, and lightly raked in, it will grow. I advise making drills about half an inch deep, because it is hardly possible to make them *less* than that depth.

Give plenty of water in dry weather after the plants begin to grow; and do not leave the covering too long on the beds, or your plants may get weak and spindly. The young plants should be ready to go out four or five weeks after sowing; and ought to be set out at the first favourable opportunity, on a dull or showery day. It is a good plan to sow a little seed every month, so as to always have some plants ready to go out whenever the weather is suitable.

If the ground is very dry at planting time, take a hose or watering-can and pour a little water on each place where a plant is to be set. This will prevent the soil from crumbling into the hole, which it will otherwise do in dry weather when the dibble is withdrawn.

Before taking the plants up, the bed should be well soaked, and, if any grubs or aphis are present, the plants, on being lifted, should be dipped in tar water or tobacco water, holding them so as to immerse every part except the roots. It is beneficial in dry weather to trim the leaves by cutting them half off with a knife. These leaves would decay and drop off in any case, and by cutting them back there is less foliage left to use up the scanty moisture in the ground. The roots should be placed in an inch or two of a puddle made of soil and water in the bottom of a bucket, and the plants carried to the field thus, and the roots should not be exposed to the sun or wind. A wooden dibble made from the handle of an old spade or fork is the handiest implement to use for planting.

When you make the hole, only make it deep enough for the plant, and put the roots to the bottom, pressing the soil firmly around it. Should dry weather continue, watering will be necessary several times a week until the young plants become firmly established; and no matter what the weather may be, it will be found of very great benefit to mulch them.

To plant on a large scale, mark out the rows with a corn-marker, and set four or five men to work planting as follows:—

One goes along first and makes the holes with a light crowbar or pointed hardwood pole; the next follows with the plants, putting one down at each hole; a third firms the soil around the plants, and leaves them planted properly; while the fourth man keeps up a supply of young plants from the seed bed. If you have one careful man to do the actual planting, the rest of the work can be done perfectly well by boys, and in this way a large area of ground can be got over in a day.

Always plant in straight rows, and have the large growing kinds 3 feet apart each way, and the smaller ones about 2 feet. It is sometimes an advantage to open a shallow furrow with the plough in each row, and set the plants in the bottom of the furrow. They are protected thus in some measure from the sun, and will not require hilling up, as the gradual filling up of the furrow during subsequent cultivation will do all that hilling up performs, and do it better.

Now the great secret of success in cultivating plants of the cabbage family is to *keep them constantly growing*, and never allow them to be checked by any cause whatever.

Push them along quickly by constant cultivation and plenty of water. A watering with liquid manure once or twice a week will help greatly to promote rapid growth. It is when plants are checked, or growing slowly from any cause, that they become most susceptible to the ravages of insect pests, plants which are growing rapidly and vigorously being seldom much injured by pests.

Further, if plants of the kind we are now speaking of take too long to mature, the heads instead of being tender and succulent become tough and leathery. Cabbage ought to be ready for table in three or four months at most after planting. Keep the ground clean, and conserve the moisture by constant cultivation. Do not cultivate only when you see weeds, but after every shower of rain until the plants get too large to allow of the implements being used among them. In the cooler parts of the colony, cabbages can be grown all the year round, but in the warmer districts it is hardly worth while growing them in the summer months, as there are so many insect and other pests to contend with that a great deal of the profit is lost in keeping the plants clean. In the warmer districts the first sowing may be made in January or February, and then at intervals of a month or so up to August or September. For summer crops, St. John's Day and Early Jersey Wakefield are about the best, as they are early sorts, and mature very quickly; in winter the Drumhead type, of which Flat Dutch and Queensland or Florida Headen are good examples, are the most profitable.

THE CAULIFLOWER.

The same conditions as are necessary for cabbage-growing are required for cauliflowers, and the importance of having rich soil is even greater.

As a rule, rich new land which has not been previously cropped will produce the best cauliflowers. The seed is sown in the same way as cabbage seed, and the planting is done in the same way also, but more care is required in planting than is necessary with cabbage.

Cauliflower seed may be sown in January or February, and again in March or April. If any is sown after April, it must be a very early variety, which will mature before the weather gets too hot. After planting, it is absolutely necessary that the plants be kept constantly growing, as a check of

any kind, whether caused by want of water, poverty of soil, or from whatever reason occurring, means serious injury to the crop, and a consequent diminution of profits. Cultivation should be thorough and pretty deep until the plants begin to head, or until the leaves spread so much that they are liable to be broken by the cultivating implements. As soon as any signs of heads forming are noticed, cultivation may cease, because, if still carried on, there is a tendency for the heads to grow loose and coarse instead of firm and compact. At this stage, however, water is more essential than ever, and a good watering with liquid manure twice a week will add greatly both to the bulk and quality of the crop.

Now, it must be remembered that the market value of cauliflowers depends entirely on their being of fair size, and *white* and *tender*. If not well looked after now, the heads will become yellow in colour, with a disagreeable flavour, and more or less tough.

To prevent this, as soon as the heads begin to form, the leaves ought to be drawn together at the top, and tied or skewered over the heads. This will protect them from the sun, and cause them to be properly blanched.

The plants should now be inspected every day, all those that require tying up, attended to, and all that are fit to cut, harvested.

It is best to cut early in the morning, cauliflowers harvested while the dew is on the plants keeping fresh for a longer period than if left until the sun gets hot.

The following indications will show when a head is ready to cut:—

The leaves bulge out considerably at the base, and the head begins to lose the polished, smooth appearance which has hitherto characterised it, and becomes grained and somewhat irregular. To examine the heads, it is not necessary to untie the top leaves, but part them at the side, so that, if not quite ready, cutting may be deferred until the next day. Cut with 2 or 3 inches of stalk and two or three circles of the leaves.

Handle very carefully, and take care not to bruise the heads in any way, as even a slight bruise soon becomes black, and detracts greatly from the market value.

Small crates should be used for cauliflowers, the large crates used for cabbages holding so many cauliflowers that their weight causes them to bruise and injure each other.

INSECT PESTS.

Both cabbage and cauliflower are subject to the attacks of insect pests. Young seedling plants are often attacked by a small grub which eats the heart right out. When the plants are more mature they are attacked by a species of moth, the larvæ of which riddle the leaves and render them very unsightly.

Spraying with Paris green in the seed bed, or dipping the young plants in tobacco water or tar water before planting, will usually be sufficient for the firstnamed pest. Paris green sprayed on the plants immediately the larvæ are discovered on the leaves will destroy most of the second.

Aphides frequently are a source of trouble, and if not promptly dealt with they increase with amazing rapidity. Weak kerosene emulsion or tobacco water will destroy aphides easily, but as in the case of all other pests it ought to be tackled as soon as it makes its appearance. Sometimes only one or two plants in a field are found infested with aphides, and in this case they should be pulled up at once and destroyed, as by so doing the pest may be prevented from spreading. It must be borne in mind that Paris green, being an arsenical poison, must not be used on crops of this kind within five or six weeks of their being ready for market. Where practicable, it is advisable to alter the ocation of the cabbage and cauliflower crops every season, as by so doing the danger from insect pests is considerably lessened.

With good soil, a plentiful water supply, and intelligent care, first-class cauliflowers can be grown in many parts of Queensland; and there is money in the business, as immense quantities of this vegetable are annually imported from the southern colonies. If they can be grown at a profit there, and shipped up here, it should be possible for us to grow them at a profit here, as, of course, being nearer to the market, we are enabled to place them for sale in better condition than those coming from Melbourne or Sydney, which, in addition to being some days in transit, are also considerably knocked about in handling. Some of the farmers in the Logan district have already awakened to the possibilities of cauliflower-growing; they grow first-class crops, and find no difficulty in disposing of them at good prices.

JADOO FIBRE.

WITH reference to our article on Jadoo fibre in the October number of the *Journal*, we are now in a position to give more particulars concerning this remarkable product.

We at that time stated that we did not know what the article was, but that we were informed that it was not a manure. On this point we have received a letter from Mr. W. R. Virgoe, Brighton, Victoria, who has lately been appointed sole agent for Australasia.

Mr. Virgoe had read the article, and now writes:—

"In your article on Jadoo, you say 'you do not know what Jadoo really is.' I did not until this last month, but I am now in possession of the detail of the process of manufacture, which I now give for your information, omitting the exact proportions of the ingredients, which, however, I am willing to also furnish, if desired. Jadoo (pronounced Jah-doo) is, I understand, an Indian word, meaning 'magic.'

"Now, as to its *not being a manure*, owing to my assertion to that effect, I have great difficulties with the Customs in South Australia and Western Australia, as on that ground they have imposed a 15s. duty, which I am trying hard to get removed, and, as you will see by the particulars herein, I think it must be deemed a manure. At any rate, I shall for the future call it a fertiliser.

"The foundation of the Jadoo fibre is absorbent peat moss, a small sample of which I send you under separate cover.

"In a large boiler partly filled with water the following ingredients are put in various proportions:—

"Soot, pink gypsum, bonemeal, phosphoric acid, potash, nitrate of soda, sugar.

"The boiler is then filled up with the peat moss in a dry state, and the whole is kept at boiling-point for thirty minutes.

'The mass is then taken out and stacked. To it is added yeast, and the mass is fermented, and kept in that state, and at a certain temperature for a month or five weeks, when it is fit for use.

"The Jadoo liquid is made in the same way, but without the use of the peat moss.

"The Jadoo Company admit that Jadoo is still only in its infancy, and that scientific research may vastly improve it."

The accompanying illustrations are from photographs taken on a tobacco plantation in the United States, on which Jadoo was used as a soil and fertilising medium. We are indebted to Mr. Reg. E. Finlay, London, late manager of the Queensland Investment Company, for the photographs.

Plate LXXXIII.

TOBACCO GROWN WITH JADOO.

Colonel Halford Thomson, F.R.H.S., the inventor of Jadoo, in a lecture delivered before the Vine and Fruitgrowers' Association of Worthing, England, said:—

Take the case of a greenhouse. As a rule, the way in which pests of any kind find their way into a greenhouse is by getting into the soil. Now, Jadoo has been kept at the boiling-point for thirty minutes, and upon that depends much of its success, for whatever living organisms may have been in the material must in this way be destroyed.

Jadoo will have no effect at all on the tap-root, but an enormous effect on the fibrous roots near the surface. Look at this picture of a *Tacsonia*. That shows you something of its effect on the fibrous roots. It is a photograph of a *Tacsonia* that I had in a large stone bed in a conservatory. It was flowering very badly. I took off the top three inches of earth, laid bare the roots, put a layer of Jadoo around them, and covered it with a board. In less than six weeks that Jadoo was simply a mass of fibrous roots; the whole three inches were full of roots, and the plant flowered grandly.

In the case of fruit trees, I have found that Jadoo enormously increases the crop of fruit. One of the greatest advantages is that Jadoo prevents flagging. When you plant out a tree, put a small quantity of Jadoo above and below—above only, if economy has to be considered—and that tree will never flag. You are certain then that you will not lose it. We have had lately some very strong certificates from the Government Forest Department at a place in Denmark, and they say that they have obtained extraordinary results by planting out in this way, and also by sowing in the Jadoo mixed with earth. The Agricultural Society of India recently sent some certificates showing the difference that Jadoo makes in the time that seed takes to germinate. In the case of tea it was eleven days for Jadoo against thirty-seven for earth; in the case of coffee, it was rooted in one-half the time it took in earth. Every kind of thing they put into Jadoo always rooted in at least half of the usual time. And that brings me back to the old point—*Jadoo encourages fibrous rooting*. That is what you want. If you are using Jadoo you are attracting out surface roots. You have the whole thing under your hand, and your are putting in something of which you certainly do not lose the effects in any reasonable period. You are improving the soil; the peat moss of which the Jadoo is largely composed remains, and is almost imperishable, so that whenever you give food afterwards, you have a medium there that will store it and convey it to the plant.

THE *Fruitgrowers' Newspaper*, London, referring to the use of Jadoo fibre, has the following article on

FORCED PEACHES.

Of the many tests made during the past year none is more instructive or important than our experiments with peaches under glass. This fruit, provided it is handled in a proper manner, can be made exceedingly profitable, and the result we secured passed all expectations. We found that our hint to ensure a cool root or the roots resting in cool surroundings was a good one. Before starting our crop we carefully went through our notebook, and we found that this point was emphasised from the results secured by other crops, hence one we should ensure in dealing with the forced peach crop. If we look at the culture of forced vines we find the root of the plant itself set outside the house, in outside soil, and our observations have led us to conclude that vines thus planted produce the best results when forced. In dealing with our outdoor grapes we find that the bunches of fruit can be considerably improved by covering them over with a glass cover of any shape or form, which focuses the heat and ensures to the grapes a larger supply of heat than is otherwise

possible, and that without applying heat to the roots. Now, the great thing was to ensure these cool root conditions to best advantage, and this we found could readily be done by the aid of Jadoo fibre, which we had already used with such good results on our pot tomato crop. We emphasise this point. We insist upon the necessity of the conditions, because it is the basis of successful cultivation as regards forced peaches, and we have proved the advantage of doing so again and again, as a reference to our bulky experimental text-books shows. As these tests have been made in our experimental house on growing crops, of which a strict daily account has been kept, they are reliable and of the utmost value to fruitgrowers.

In potting the trees, the roots rested in a mass of Jadoo fibre, care being taken that it was all covered well with soil to prevent drying out. It is useless to put Jadoo on the top of the pot on that account, and if this point is observed then its effect will be exceedingly beneficial. A good soil was used, the roots were well firmed in the earth, and the drainage conditions were all that could be desired. A waterlogged soil, or a moisture-laden atmosphere without a free circulation of warm air is injurious to the peach, and must be avoided. As the Jadoo fibre keeps the roots in cool condition, water must not be supplied too freely, this being regulated by the actual wants of the trees, which are easily observable. We used good turfy loam and a sprinkling of sand. A good thing to ensure at starting is a low temperature; the more gradual the start is made the better, 40 degrees being ample. Then great care is needed not to have too high a temperature when the fruit buds show—in fact, not until the fruit sets—as too high a temperature will result in the loss of fruit. If a temperature first of 40 degrees at night, increasing to 50 degrees after the fruit is well set, and after the stoning period of 55 degrees or 60 degrees by night, and 70 degrees to 80 degrees by sun heat, is ensured, things will be satisfactory. Then after the fruits are half-grown, a higher temperature accompanied by free supplies of moisture and foliage syringing, will bring the crop on in good condition. When the fruit is colouring, ample supplies of sun heat are needful, and plenty of light and air also tend to the production of perfect fruit.

We might add that the trees in pots were taken into heat in November, and that they were set in 12-inch pots. We watered only with warm water. As the result we found the trees gave a very large crop which had to be freely thinned. The trees gave a good fruiting growth, and fruit of exceptionally high quality. Some of the fruits measured 10 inches and 11 inches in circumference. They were splendidly coloured, and the trees were loaded. The variety grown was Hale's Early. There can be no doubt that the heavy crop and the fine quality and colour of the fruit was due to the cool condition of the roots, ensured by the free use of Jadoo fibre; consequently this test proves the great value of this material in peach culture, either under glass or in the open air. The point we have proved is of the utmost importance in forced fruit culture, and it is one that we think we are justified in claiming has never been brought out by any writer in any other publication on fruit culture.

THE increasing demand for Jadoo fibre would seem to warrant the idea that there is ample room in Melbourne for the establishment of a manufactory of this valuable material. The original establishment in England has developed into a very large affair. A similar factory was not long since started in France, and now we find that at Philadelphia, U.S., a very extensive factory is being built. This will have a capacity for making 8 tons of fibre and 1,000 gallons of Jadoo liquid per day. The Philadelphian Company are making arrangements for supplying the trade in Mexico, South America, the West Indian Isles, as well as the States.—*Australasian.*

TOBACCO.

CIGAR LEAF-CURING BARN.

THE style of tobacco barn generally adopted in Florida corresponds closely to that of Cuba, being wide and low rather than high and narrow, as in the Northern States. It should run from north to south the long way. Of whatever length it is built, take half the length minus 1 foot for the breadth, and with these dimensions a well-shaped barn will be constructed. For instance, a barn 20 feet long would be 9 feet wide. Two-thirds of the width is taken for the length of the rafters. A thatched barn in Cuba would add 1 foot to the above length in order to make a steeper pitch to give the rainfall a more rapid descent. The posts are to be 12 feet from the ground to the eaves.

A house of these dimensions is to be divided into sections, allowing a space of 27 inches between each two sections, so that a man may easily get in to put up or bring down the poles. The same space, 27 inches, should be left at each end, between the wall and the pole racks, to afford the same facility. A passage 3 feet in width should be left, dividing the barn into two equal parts; and each half will have four sections in each side of the passage. There will thus be eight sections, and each of these will have an area of 4 square yards. The apartments are formed by posts.

The poles for a barn of the foregoing description must be at least 13 feet long.

The poles filled with tobacco are placed on strong rails of the length of the sections, nailed horizontally on the posts which form the sections—namely, about 3 feet, so that the tips of the leaves of one rack shall not touch those next below. This is for the tobacco cut up Cuban fashion, in saddles of two leaves, while for primed tobacco the interval may be shorter, as the leaves do not hang down a yard.

A window or ventilator must be left at the top of each gable, and all around the ends and sides the windows or shutters should not be over 5 or 6 feet apart, and hinged at the top so that the bottom can be slightly swung out to admit the air without permitting the sunshine to enter. In a damp locality the siding and ventilators should be well tight to exclude the moisture when it is excessive.—*Southern Tobacco Journal.*

TOBACCO UNDER COVER.

In Florida, which is so largely occupied in the production of luxuries, nothing is neglected by enterprising growers which will improve the quality of their products. There is no other country in the world where the fertilising of oranges and pineapples for flavour, of strawberries and tomatoes for appearance, flavour, and carrying qualities, and of tobacco for flavour, texture, and burn, is carried on to a higher pitch of development than in Florida. Now comes the culture of tobacco under cover, as a means of producing an extra silky texture and a highly burnished surface for cigar wrappers.

A prominent firm of Quincy, Gadsden county, experimented with this method for three years, beginning with a half-acre; and the result was so satisfactory that last spring they had over 100 acres under cover, partly belonging to tenants for whom they erected the shedding under agreement to purchase the tobacco of a certain grade at a uniform price of 27 cents per lb., pole cured. The roofing is constructed of cypress lath and wire, the lath so spaced as to furnish a half-shade, placed on posts 7 feet above the ground, thus permitting cultivation underneath, and costing about 225 dollars an acre. It is calculated to last five years, though the orange and pineapple growers figure a much longer life for their sheds, similarly though better constructed.

It is stated that about 90 per cent. of the leaf grown under this cover grades as wrapper. This, and its spotless gloss, the immunity from insects, hail, beating rains, and the scald which sometimes occurs at the beginning of the rainy season, are considered to yield an ample profit on the heavy expenditure. This is the first year of extensive culture under this system, and the results have not entirely equalled expectations, since this rainy season gave an unusual amount of precipitation, whereas the shading system will naturally develop its strong points best in a dry season.

The unusual amount of rainfall and cloudy weather gave the leaves an abnormal succulence and brashness, which have not characterised them under previous tests. The system is considered to be approved and established; however, it is to be of great value, and will be further extended next year.

A small experimental plot was grown under cover in the peninsula proper at San Mateo, and the results are regarded as favourable.

But the most elaborate and expensive operations have been conducted by a wealthy firm of truckers at Tampa, who have experimented in covering lettuce, celery, and other vegetables. They have felt their way along, and the results have been so encouraging that they are now preparing to grow twelve acres of wrapper leaf under cover. They use canvas gauze, which costs 600 dollars an acre, to which the expense of labour, fertiliser, &c., is to be added, bringing the total outlay up to 1,000 dollars an acre for the first crop. They will raise three crops of tobacco a year, which will reduce the average of the final cost per acre to about 600 dollars. They produce wrapper leaf, which is extraordinarily fine and silky, bringing the highest prices paid in the Tampa cigar factories. What their profit may be is, of course, known only to themselves, but it is believed by tobacco experts who have watched their crops as marketed that they realise from 1,000 dollars to 1,500 dollars gross per acre for the main crop.—*Florida Agriculturist.*

Bush Work.

BY A. J. BOYD.

CROSS-CUTTING.

IT will be remembered that we dropped our tree across a couple of small logs, thus raising the butt some 6 inches from the ground.

It will sometimes happen, however, that the tree has a decided curve, unnoticed when selecting it. When the tree falls with the convex or curved side uppermost, our logs are of no use. The butt is jammed into the ground, and has to be raised before the cross-cutting can be finished.

But before cutting off a log we must know what we want. If we want rails, the log must be 9 feet long, or 9 feet 6 inches is better. If posts, these will require to be 7 feet long. For ordinary slabs, 7 feet 2 inches is the correct length. For palings, well—that depends upon the order. Some people want 4-foot palings, others 5 feet, and so on. Five feet is, however, a good staple length. For shingles, 15 to 17 inch blocks must be cut.

We must not forget that it may happen that we lose our saw-set, and then it is well to know how to set the saw without it. This is effected by the help of two wedges. A wedge has a somewhat rounded base, and it is this formation which enables us to take advantage of it in the case of the loss of the saw-set. To operate with the wedges, drive one of the wedges firmly a short distance into a log or shingle block. Then arrange the saw so that a tooth lies on the wedge, the point slightly raised.

Plate LXXXIV.

INTERLOCKED TREE.

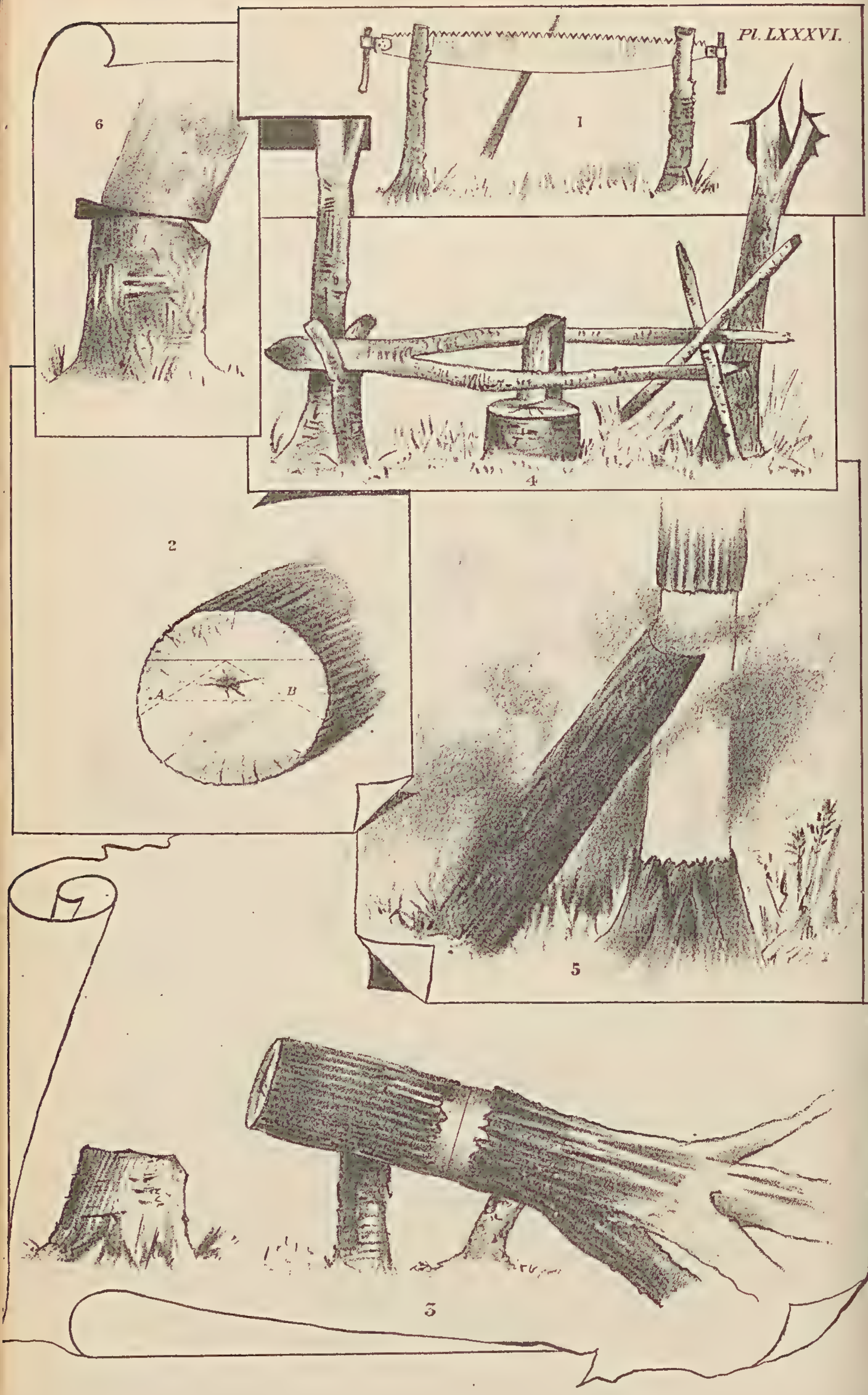
TREE WITH EXTERNAL KNOTS.

Plate LXXXV.

A WINDING TREE.

FREE-RUNNING TREE.

Pl. LXXXVI.



A gentle tap with the other wedge will bend down the tooth point sufficiently to give the tooth the necessary "set." Treat every alternate tooth in the same manner. Then turn the saw round, and do the same to the other teeth. A good saw-sharpener will thus set a saw as evenly as could be done by the use of the set. It is well to perform this operation before sharpening the saw, as the taps of the wedge are liable to injure the edge of the tooth.

To sharpen the saw, a sort of horse is required. This is best made by cutting down two saplings growing about 4 or 5 feet apart, at a height of some 3 feet from the ground, as in Fig. 1. Saw a vertical cut from the cut-off top of the sapling about 6 inches deep. Then place the saw back downwards in the cuts. It will incline to sag backwards and forwards as filing proceeds. To prevent this, lean a small sapling against the centre of the saw, and the latter will remain rigid.

Taking a three-cornered file, stand over the saw, the left arm well over it, and the right on the inside holding the file inclined upwards at an angle of 45 degrees. Only use the file in one direction—*i.e.*, pushing it from right to left. Never saw the file backwards and forwards, as it injures the thread of the file, and does not hasten the work.

File up every alternate tooth; then operate on the remainder in the opposite direction.

For a flat tooth, hold the file horizontally; for a needle point, almost vertically.

Now we are ready to take off our first cut. Enter the saw perpendicularly, or rather at right angles to the log, first having taken off a ring of bark. No pressure must be placed on the saw. Let it run easily and cut by its own weight. It will soon bury itself. After cutting more or less deeply towards the centre (according to the size of the log), tilt up one man's end of the saw and cut down the side. Then reverse the proceeding, and cut down the other side. This makes the work easier, as, instead of sawing continuously at the full breadth of the wood, an angle is presented, as in Fig. 2.

When the saw has again cut down vertically as far as *a* and *b*, it will probably be found that the work becomes harder as the cut will begin to close, especially if the log be convex, as above described. To ease the saw, insert a wedge in the cut on top and drive it home gently till the saw loosens; then continue the cutting, wedging up till the log is severed. Another plan is to drive a piece of timber underneath the cut, thus raising the log at that part and causing the cut to open.

We will suppose the tree to have fallen in such a manner that the butt lies 2 or 3 feet clear of the ground, as in Fig. 3. In that case it would not do to begin cross-cutting until we have made arrangements for preventing the splitting of the log before it is completely cut through. There are several ways of doing this. The simplest is that shown in the figure.

In this case, however, there is some danger to the sawyers. When the log is severed, it will naturally fall to one side or the other, and watchfulness and agility will be required to escape being crushed. As time is not always of very great moment in the case of timber-getting, it is better to make sure of one's life than to risk it by carelessness. Therefore, instead of putting a couple of blocks under the log as shown in the drawing, the better and safer plan is to build up a few logs underneath it, which will present a broad surface for it to rest on. Then a couple of wedges on each side will effectually prevent its moving when cut through.

Having cut off a length either for posts, rails, palings, or shingles, the next business is to burst it open. Let us take the operation as it affects posts. If we are working up an ironbark-tree or a pine, we first remove the bark. With gum-trees this is not necessary. Bushmen all have their own peculiar fads about opening a log. Some burst it completely in half to commence with, others first open the log from end to end, and then burst off billet after billet. Others again "slab" off without bursting, but this process is only

resorted to when excessively wide slabs are required, and is of no sort of use in post and rail splitting. I always preferred to take the second plan, especially with a pipy log.

To begin, take the smallest and thinnest of the wedges, called the "entering" wedge. Drive this into the cut face at a point about 4 to 6 inches from the sap wood. If the log is a free one, a cracking and rending will soon be heard. Then enter a second wedge a little below the first and nearer the centre. Strike alternately at these with the maul till they are buried to the head, then insert a wedge in the crack opened on the top of the log and drive it partly home, helping its action by a couple more wedges further along. When these are got home the upper part of the log is burst. Take the axe and cut any strings or splinters which may be holding the burst sides together. Then remove the wedges.

If the log is a tough one, it will often happen that the entering wedge will jump out when struck. Should this occur, heavy blows of the maul are useless, but a gentle tapping will often send the wedge home sufficiently to give it a good grip. It is a good thing also to put some sand or earth into the opening made by the wedge, and this will usually have the desired effect.

Having opened our log, we now have to decide on the width of our rail—whether 10, 12, or 15 inches. Say we decide on 12 inches. We enter our wedges, as before, 12 inches from the opening, and shall now experience no difficulty in wedging off a billet 12 inches wide. We continue doing this on both sides of the log until only the bottom portion remains. We turn this over on its face, and then split it into three or four remaining billets. A log 3 feet in diameter has thus produced us nine triangular billets, from which the rails have now to be "run." Running off the rails is light work compared with "bursting" off the billets.

The billet is laid on its back or side, and a wedge is entered at a point at either end, which will lift off the "heart" and leave the billet of a width of 12 inches on one side and 6 on the other. Now we take a wedge, and stooping over the end of the billet, with a series of light taps, mark off the thickness of the rail—say 2 inches. Then we enter two wedges at once, to prevent the wood splitting in a wrong direction. Sometimes when these are entered, a good drive of the maul will send them almost to the end of the billet, the rail jumping off without any more wedging being required. If it does not do so, then we take the running-out axe (which is about 14 inches long). Pass the blade in just ahead of the wedges, and heave on the long stout handle. The slab will be wrenched off for some distance.

Now, if the splitter slacks up on the handle to get a fresh purchase, he will find he cannot move the axe an inch forward, because the slab at once closes down on it and holds it as in a vice. Therefore, before slacking up, put in a wedge edgeways behind the axe; then you can slack up, and the axe will move a foot or so forward. Now give another wrench, and let your mate follow up with the wedge till a final "snap" indicates that the rail is run off. This will be our narrowest rail—say about 8 inches wide. Proceed in the same manner with the next until the billet is expended. We shall have from four to six rails according to the thickness, but four is the usual number.

It does not always follow that rails will run out so accommodatingly as those described. When running off the first rail, we see the split getting further and further towards the sap, and this means that the rail will be 2 inches thick at one end and 6 inches at the other. It also means that our billet is ruined, or, at most, that we shall only get two rails out of it—a heart rail and an "outsider." We can, however, to a certain extent, obviate the trouble if we notice it in time. The remedy is to withdraw the axe and wedges, and start at the other end. Now here comes in a nicety in splitting. The rail is running out to a *thick* end. Obviously if we re-commence operations at that end, the rail will run to a *thin* end. Hence we must start our rail at a good thickness—say 4 inches. Now we run it out, and it gradually becomes thinner, meeting the other split about the centre. We have saved our rail, but it is what is

technically known as a "met" rail, and possibly useless owing to weakness in the centre. The late Mr. James Tyson, the Australian millionaire, was a good judge of rails. On one occasion he had a contract out for some miles of fencing; and being on the station when the fence was going up, he used to walk down and inspect the rails. When he found a suspicious-looking "met" rail, he placed one end on the lower rail of the fence and jumped on the centre. If it held out, well and good—if it broke, that rail was not paid for.

In the olden days, the heart was often put in as a top rail, but it is usually brittle, especially in the case of gum timber, and will decay much sooner than the others. Knots and excrescences on rails are not a disadvantage. Indeed, a knotty rail is often stronger than any other.

There is no need to go further with our description of rail-splitting. Each log of our 3-foot tree has yielded us from 27 to 36 rails; and if it has been a free bursting tree and a good running one, we can get from 100 to 150 rails in a day. At £1 per 100, a couple of men in good timber can thus earn an excellent livelihood.

When I was timber-getting on Chiltern diggings, in Victoria, the price ran as high as £4 per 100; and as we were working up stringybark-trees, the freest of all our forest timbers, it may be supposed that we made a handsome weekly cheque.

It may be asked why we did not at once cut up our whole tree into logs. It is because we might discover that the first log was either impossible to split, or that it ran so erratically that it would not be worth while to work up any more. Sometimes a fairly straight-looking tree will run rails somewhat "windy." Still it should not be rejected on that account, as a good fencer can work windy rails into a fence without detriment to its strength.

Post-splitting differs from rail-splitting, in that tough windy timber may be used, posts being of double the thickness of rails, and great thick heavy ends are rather an advantage than a detriment.

Slabs are run out in the same manner. Staves are split differently. Silky oak is the timber used for this work. The staves are all got the "bursting" way. No running out is done. The reason for this is that if the staves were run out the bilge of the cask would shell off much like an Austrian bent chair exposed to wet and sun.

SHINGLES.

The prettiest work in connection with splitting is the getting of shingles. Many trees that would not do for posts, rails, or slabs will work up into excellent shingles.

The blocks are cut off about 15 to 17 inches in length, and are burst into billets of a width of 6 inches.

Some preparation is required for splitting shingles.

First, a horse has to be erected. The horse consists of a stout forked sapling with a butt about 3 feet long and 6 inches in diameter.

The butt is supported against a tree at a height of about 2 feet from the ground on a leaning fork. The two ends of the branches forming the horse are supported by two saplings slanting crosswise against another tree, as shown in Fig. 4.

A block is placed on the ground, which serves to support the billet to be split. The splitter has his billets lying handy, and usually piles up a dozen on the left side of the horse.

With his shingle throw in his left hand and wooden mallet in the right, he halves the billets, then quarters them, halves these quarters again, and so on until the whole billet is split into shingles from $\frac{1}{4}$-inch to $\frac{1}{2}$-inch thick. The sap shingle is usually thrown away, and no shingle under 3 inches in width is retained. The waste in shingle-splitting is very great, all hearts and outsides being rejected.

A good splitter will run out 1,000 hardwood or as many as 2,000 pine shingles in a day.

Some run each shingle off separately, but this requires judgment, as, when the first shingle is off, the next will run to a thick end, and the third to a thin end, entailing loss of time and possibly temper; so that the halving and quartering principle is undoubtedly the best.

In my next I shall deal with the splitting of palings and spokes, and with morticing post-holes and fence-erecting.

Figs. 5, 6, and 7 are given in illustration of my article on Bush Work in the January number of the *Journal*.

Dairying.

WHEY BUTTER.

THE making of whey butter, which is practised by many Somerset makers of Cheddar cheese, is without doubt a very thorough and economical way of obtaining from the milk of the farm everything of value before the residue goes to feed the pigs.

The whey from which the cream is skimmed is drawn off from the cheese tub in the ordinary course of the day's work in cheesemaking, and strained up into leads, which usually average about 20 inches in depth. Here the whey remains till the following morning, when after about a total of eighteen hours' setting the cream may be skimmed off the surface, and the remaining whey is then ready for the piggeries.

TREATMENT OF CREAM.

The cream on being obtained from the whey is then scalded, usually by placing the vessel containing it into a furnace of hot water. This practice of scalding the cream serves two purposes:—(1) To cause to separate out from the cream any whey, which may still be held suspended or entangled amongst the fat globules. (2) To add to the keeping qualities of the cream, or rather to so sterilise the whole bulk of cream as to give a fair start to the ripening process without any risk of hindrance or injury from the whey ferments. After scalding, the whey cream may be poured into a vessel to cool, and the most convenient utensil for this purpose is an earthenware glazed jar or crock, fitted with a peg hole or tap at the bottom. During the twenty-four hours' cooling to which it is subjected, the whey which may be in the cream will separate out and settle (being the heaviest portion) at the bottom of the crock, and may be drawn off by means of the tap provided.

The cream may now be poured into the cream can or other vessel deputed to hold the whey cream till sufficient is accumulated for a churning, care being taken, as in the proper management of all cream, to well stir the whole on adding a fresh portion to the stock lot.

CHURNING.

In churning whey cream the same rules may be followed as in churning the better article, though some additional attention will be required in the matter of ventilating in the earlier part of the churning process, as the quantity of gas liberated from cream of this character is very considerable. Two washings should be administered to the butter when in the granular stage, which may be followed by brining or dry salting, as the maker decides best.

Pl. LXXXVII.

A Kick Up

THE FINISHED PRODUCT.

Whey butter has a characteristic sweet taste of its own, which is very pleasant to the palate, although it cannot be compared in point of quality and flavour to a good sample of butter made from the cream of new milk. It may readily be salted down in pots for the winter, and will be found excellent for kitchen use, both for cooking and the making of buttered toast.

In the early part of the cheese-making season—*i.e.*, the spring of the year—a little colouring matter will not come amiss, and should be added to the cream before churning.

As to the market value of whey butter, this usually runs about 2d. per lb. lower than the price of best or new milk butter, and is in great demand among the workpeople of the districts in which it is made.

BUTTER RATIO, Etc.

In the experience of the writer, the whey obtained from 60 gallons of milk is sufficient to afford 1 lb. of finished butter, but it will readily be seen that variation in the manufacture of the cheese and other matters, such as the prevailing weather, exercise some considerable control over the yield of butter. For instance, in still warm weather, the cream will not rise to the surface of the whey in nearly such quantity as throughout a cool breezy night.

The following analysis of whey, taken from Professor McConnell's Agricultural Note Book, is worth recording:—

THE ANALYSIS OF WHEY.

Water, 9·30 per cent.; albuminoids, 1·0; fat, ·3; milk, sugar, &c., 5·0; ash, ·7. It will be seen that the butter-fat contained amounts to ·3 per cent. This would mean that 3 lb. or thereabouts of butter could be obtained from 100 gallons of whey if the whole of the fat was recoverable, but in practice one could not expect such a result; and under the circumstances attending cheese-making, &c., the ratio of 1 lb. in 600 means a very reasonable return for the extra labour involved.

A VISIT TO A DUTCH CHEESE FACTORY.

Every traveller in Holland soon becomes familiar with that eminently characteristic Dutch product—the Edam cheese. It invariably appears on the table at every meal, while cheese sandwiches—thin slices of "Edam" between the halves of a cut, fresh roll—seem to be extremely popular at all the cafés.

As is well known, the Edam cheese is globular, hence the fanciful French name of "cat's heads" (*tetes de maure*) applied to them. They weigh about 4 lb. each, and, when carefully cured, keep for several years. The best kinds are made in North Holland—Edam, Alkmaar, and Hoorn being perhaps the chief centres. A true "Edam" is a fatty cheese made from full-cream milk, while those made in Friesland are, as a rule, much poorer, as only skim-milk is used in their manufacture. It is said, however, that the milk used for Edam cheese-making must not be too rich in fats, but, seeing that the supply invariably comes from cattle of the Dutch breed, it is extremely unlikely that the milk will ever err on the side of excessive richness.

The cheeses are made either by the farmer himself or in factories run on the co-operative principle. The methods pursued on the farms seem to be rather primitive, yet I was told by the dealers that they prefer the farm to the factory-made cheese; and certainly the farmer's wife (who seems, by the way, to do most of the work while her lord stands by and smokes), apparently by long practice and experience, has undoubtedly discovered the right "tricks" to secure the desired results.

The factory system seems to be well established, however, and probably the majority of farmers would find it the most economical method of utilising their milk if a factory building was situated near enough to their farms. The farms in Holland are notoriously small—40, 50, or 60 acres being perhaps the average size. Frequently the amount of milk at the disposal of one farmer is only sufficient to make four or five cheeses a day; in such cases it would obviously be advantageous to send the milk to a factory. Indeed, many farmers, we were told, stop making cheese at home in the winter when the milk supply is reduced, preferring to send what milk they have to the nearest factory.

Last October we visited a cheese factory at Middle Beemster, about eight miles north-west of Edam, arriving early enough in the morning (between 5 and 6 o'clock) to see the milk being brought in by the farmers. It is carried in butts or barrels, two or more being placed on the long, low carts so common in the country, and hauled by dogs, or less frequently by horses or men.

The milk is sold by weight, the average of all-the-year-round contract price being four cents (five cents = a penny) the kilo (= 2·2 lb.).

After it is weighed each lot of milk is poured into a large receiving vat through a sieve, resting upon a cloth supported within a wooden frame that rests upon the side of the tank. The sides of the vat are hollow, to allow the admission of steam for heating purposes. The outer case is made of wood, and the inner of tin. When the vat is full enough, the steam is turned on, and the milk, with frequent stirring, is raised to a temperature of 84 degrees to 86 degrees Fah. Then colouring matter, rennet (and sometimes also a little saltpetre), are added to the milk, and thoroughly mixed.

In about half-an-hour the curd is ready to cut. This operation is performed with the greatest of care, so as to prevent as far as possible the loss of fat. When the curd is cut as fine as required, the operator keeps agitating the whole mass with his cheese-knife—moving it gently backwards and forwards until it is time to draw off the whey. Judging from the extreme caution and deliberate slowness with which the operation is performed, the process of removing the whey from the curd must be a very important and critical one. After the bulk of the curd-free whey is run off, the curd is drawn to one side or end of the vat by means of shallow wooden bowls, and pressed with apparent care, so as to exert a particular and discreetly regulated pressure upon the mass of curd. A certain quantity of whey runs out, and this is immediately removed by the use of the bowl. The operation is repeated many times, and the exuded whey always bailed out as often as there is a sufficient quantity collected.

The next operation is that of moulding the curd into the characteristic shape of the Edam cheese. The complete mould is a divided hollow sphere, forming two hemispherical cups, with several holes at the bottom for the escape of the whey. A half mould is taken, and the operator with her (or his) hands gathers up a mass of curd and rams it into the mould, squeezing it down and heaping it up high enough to fill the corresponding other half of the mould. After fashioning with the hands by repeated squeezings, the mass is allowed to stand for a few minutes, then the filled mould is taken up in the right hand and the curd adroitly tumbled out into the left hand, the empty mould rapidly whisked through hot water, and the curd replaced. It is then laid aside until the batch is completed. When they have been all treated in this way they are all gone over again, taken out of the mould, weighed to an approximate weight (adding to or taking away from the curd according to circumstances), then wrapped in a damp cloth, replaced in the mould, covered with the duplicate half mould, and sent to the press.

The time they remain in press depends apparently upon the time of year and what the intended journey of the cheese is to be. In the present case we were told that they would be kept under pressure for six or seven hours. In winter they are taken out sooner, while those intended for export to India are kept in longer. When taken from press the cloth is removed and the cheese placed in a shallow mould, and put with others in a wooden box. On each cheese some salt is sprinkled over the upper exposed surface; the second day

more salt is added, and the cheese turned, so that the whole surface is covered with salt. After a few days the cheeses are put into tanks of strong brine, and kept there until they become somewhat hard to the touch. Then they are removed, washed in fresh water, and dried.

After this the cheeses are transferred to the curing-room, a high, airy compartment, lighted with diffused sunlight only. The floor of this room is occupied with closely-placed rows of stands, carrying tiers of shelves, upon which the cheeses are arranged side by side. For the next four weeks careful watch is kept, and the cheeses turned frequently (once a day, I believe). The atmosphere must not be too damp, while dry, cold air is fatal to success. A wet and dry bulb thermometer is kept on the wall, and its reading in one room visited was 14·6 degrees Centigrade for the dry and 15·7 degrees Centigrade for the wet. Sooner or later the surface of the cheese becomes covered with a growth of mould. This, however, is rubbed or scraped off so soon as it reaches a certain degree of luxuriance.

It is usual to send the cheeses to market before they are fully cured—when they are between, say, four and six weeks old. The dealers have large curing-stores similar to those already described, and to the shelves of these the cheeses, fresh from the market, are sent, where they undergo the final changes of curing and preparation for the provision dealer or export agent.

The preparation essentially consists of smoothing the surface of each cheese by the use of a machine and by rubbing in linseed oil. After this they are coloured according to fancy or fashion—sometimes red, sometimes yellow, and occasionally red and blue in alternate bands. Those intended for home consumption, however, are not, as a rule, coloured at all. The wholesale price of the best "Edams" is at the rate of twenty-one guilders (a guilder equals 1s. 8½d. English money) for fifty kilos (= 110·2 lb.), or twenty-six guilders, including freightage, to a London wharf.—*Agricultural Gazette* (London).

SELECTION OF FEEDING CATTLE.

POINTS IN A FEEDING ANIMAL.

This is an important matter to all concerned in agricultural or pastoral pursuits. If the cattle are merely purchased by the farmer to winter in the straw-yard, and to be again sold out in the spring as stores for grazing and finishing off in the fattening land of the pastoralist, it is just as important to him as to the latter that proper care and discrimination should be taken in selection.

It is common knowledge that certain descriptions of bullocks will thrive better than others. By appearance it is quite possible in many cases to at once determine the likelihood of the cattle being what—to use a general term—can be described as "good doers" or otherwise, as the case may be. Then, again, it is most essential that the animals selected should be of a build likely to produce when fat the largest weight of beef on the more valuable parts of the carcass. Experience, of course, is an essential need in successful occupations of all kinds, and, consequently, it is of interest to all to have brought before them the experience which, in some form or other, all engaged in this occupation have from time to time gained.

The following may be taken in a general way as being useful aids in assisting in the proper selection of cattle for feeding.

They must be well bred, of a blocky frame, with stout build on short straight legs, wide, level back and loin, well-sprung ribs, fulness at the back of the shoulder, and in the flanks both fore and hind, prominent brisket, full neck vein, wide chest; this being most important and essential, for if mean and narrow at this point it may be almost taken as a certainty that the animal will never thrive and do as should be the case. Then the "handle or touch" (for, no matter how poor an animal may be, the "touch" is there all the same) must be soft and mellow, and the skin supple and covered with fine silky hair, giving

what may be called a "thick, mossy coat," without harsh or hard touch. A strong, vigorous, natural appearance, with head not coarse, but strong, having its feature clean cut with prominent and clear eye, and quiet temperament are essential.

AVOID COARSENESS

in every respect, but more particularly so in regard to the head and horns as well as in bone. A coarse animal, if critically examined, will generally be found to have every indication of producing its flesh upon the more undesirable parts of its carcass, beside having a far larger weight of offal when ready for the shambles.

Another point to be remembered is that a coarse or rough appearance, especially in the cases where such indications are to be noted in reference to head, horns, or bone, will generally be found to result in the production of a carcass of beef not of so high a quality or so fine in the grain as will be found to be the case with animals whose appearance denotes better and more careful breeding with quality and fine character.

UNDESIRABLE TYPES.

Avoid by all means animals that are narrow and mean, that show in their store condition unevenness in build, or want of proper development. Remember that the object is to produce meat of the highest quality and value at the smallest possible cost.

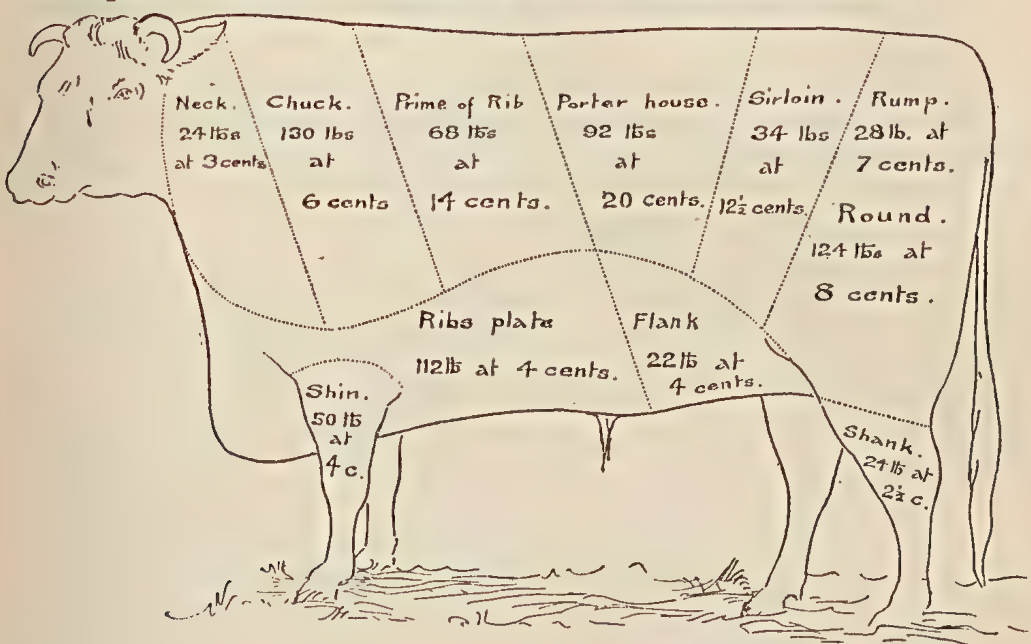
Some possibly may be apparently cheaper—*i.e.*, cost less per head when bought—but this is only one item in the expenditure; and it is quite certain that the greater expenditure, wherein lies either the profit or loss, is the capabilities of the animal itself to make full and proper use of the food it consumes; and one must look to this. Hence, there cannot be any doubt of the great need, as stated at the commencement, that great discrimination and care should be exercised in the selection of cattle for the purposes of either rearing in the winter's straw-yard, or for grazing out in the summer pasture.

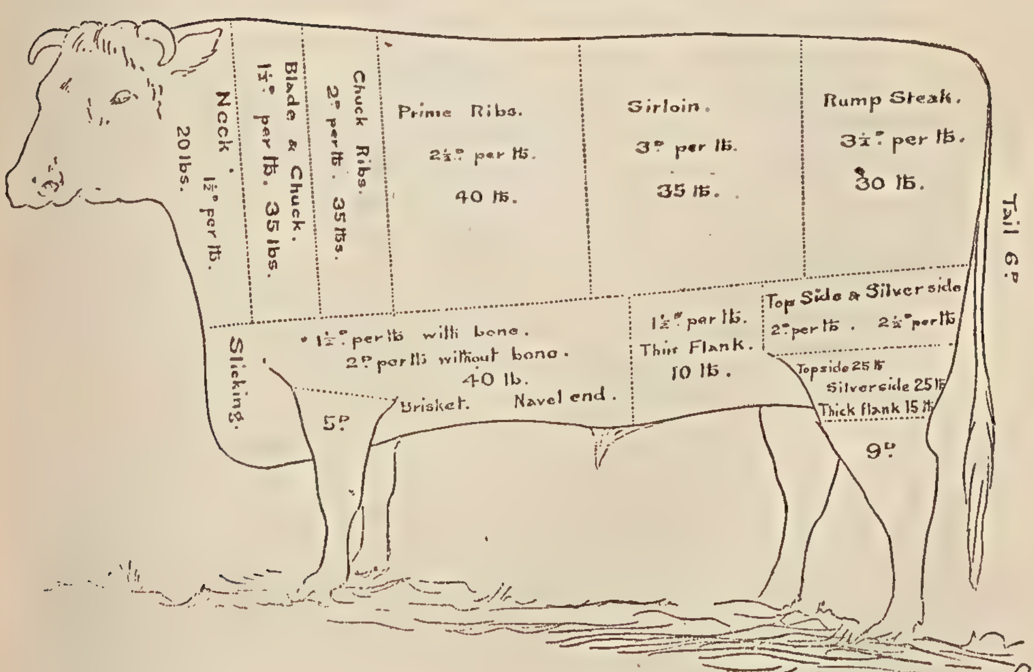
The Canadian idea of what constitutes a good beef beast may be gathered from the following description by Professor C. F. Curtiss in the "Annual Report of the Bureau of Animal Industry of that country:"—

It was not until within recent years that the heavy, inordinately fat, or rough and patchy bullock became unpopular to such an extent as practically to drive his class from the market and to banish the type from the breeding herds. It is well that this was done, for the modern type makes beef at decidedly more profit and economy to both the producer and the butcher, and furnishes the consumer a far superior article. The parts furnishing the high-priced cuts must be thickly and evenly covered with firm, yet mellow, flesh, of uniform good quality, and alike free from hard rolls and blubbery patches. Coarse, harsh, and gaudy animals will no longer be tolerated, much less those that are bony and bare of flesh on the back and ribs. The men who buy our cattle and fix their market value are shrewd enough to know almost at a glance how much and just what kind of meat a steer or carload of steers will cut out, and if the producer overlooks any of the essential points he is compelled to bear the loss. Then, in addition to securing the general beef form and make up, together with good backs, ribs, and loins, there is a certain quality, character, style, and finish that constitute an important factor in determining the value of beef cattle. One of the first indications of this is to be found in the skin and coat. A good feeding animal should have a soft, mellow touch, and a soft but thick and heavy coat. A harsh, unyielding skin is an indication of a sluggish circulation and low digestive powers. The character and finish exemplified by a clear prominent, yet placid eye, clean-cut features, fine horn, and clean, firm bone, all go to indicate good feeding quality, and a capacity to take on a finish of the highest excellence, and consequently to command top prices. Coarse-boned, rough animals are always invariably slow feeders, and hard to finish properly. A certain amount of size is necessary, but it should be obtained without coarseness. The present demand exacts quality and finish rather than size. Besides these qualities, and above all it is necessary to have vigour and

constitution. We find evidence of these in a wide forehead, a prominent brisket, broad chest, well-sprung ribs, full heart girth, and general robust appearance; and without these other excellence will not have its highest significance.

We give two illustrations which will serve to clearly indicate the different styles of cutting up a fat beast in America and in Queensland. We have also given the average prices obtained in the two countries for the same cuts. These prices naturally vary according to the law of supply and demand.





Taking the American beast as one type, we present the carcass of a well-fattened grade steer as cut up by the Chicago butcher, giving retail price per 1 lb. for the different cuts.

A good 1,200-lb. steer dresses about 800 lb.; and, of this, 708 lb. is marketable meat. Notice that all the best cuts are taken from ribs, loin, and hindquarters. These valuable cuts together weigh 346 lb., and at the prices quoted sell for 44·55 dollars (about £9 5s.). The less valuable cuts, from the forequarters, belly, and flank, weigh 362 lb., and bring only 16·48 dollars (about £3 6s. 5d.).

The head, tongue, tail, heart, liver, kidneys, &c., are not taken into consideration here, yet they have a money value as meat, which will add from 3s. to 4s. to the meat value.

Taking the different cuts, we get at the total value thus:—

		£	s.	d.
24 lb.	at 3 cents.	0	3	0
130 „	6 „	1	12	6
68 „	14 „	1	19	8
92 „	20 „	3	16	8
34 „	12½ „	0	17	8½
28 „	7 „	0	8	2
124 „	8 „	2	1	0
112 „	4 „	0	18	8
22 „	4 „	0	3	8
50 „	4 „	0	8	4
24 „	2½ „	0	2	6
708 lb.		£12	11	10½

Our second illustration shows the English method of cutting up a fat beast of 850 lb., and the prices obtained in Queensland for the various cuts. Such a beast will dress about 640 lb. of marketable beef as follows:—

	lb.	Per lb.	£	s.	d.
Neck	20	... 1½d. ...	0	2	6
Blade and chuck	35	... 1½d. ...	0	4	4½
Chuck ribs	35	... 2d. ...	0	5	10
Prime ribs	40	... 2½d. ...	0	8	4
Sirloin	35	... 3d. ...	0	8	9
Rump steak	30	... 3½d. ...	0	8	9
Brisket	40	... 1½d. ...	0	5	0*
Thin flank	10	... 1½d. ...	0	1	3
Top side	25	... 2d. ...	0	4	2
Silver side	25	... 2½d. ...	0	5	2½
Thick flank	15	... 2½d. ...	0	3	1½
Shank		... 9d. ...	0	0	9
Skin		... 5d. ...	0	0	5
			£2	18	5½

(* 2d. without bone.)

This being the retail price of one side, the whole beast, with the exception given above, yields £5 16s. 11d. of marketable beef. Add, say, 5s. 1d. for head, tongue, tail, kidney, heart, &c., and we arrive at a return of £6 2s. for an 850-lb. beast as compared with £12 11s. 10½d. for the American 1,200-lb. steer. By reducing the weight of the latter to that of the former, the retail price of 640 lb. of American beef would be a little over £11 as compared with £6 2s. obtained retail in Brisbane.

MILK TESTING.

RAPID FAT DETERMINATION PROCESSES.

The rapid methods for determining fat in milk, which are so universally used at the present day, are all, for the most part, improvements on the Lactocrite, which was the first of these methods, and, although not in common use at any time, was the original test, employing, as do all the present-day methods, centrifugal force.

The idea in all these processes is to dissolve the casein of the milk by a fairly strong acid. While this action is going on, there is necessarily a great rise in temperature, the liquid becoming very hot. This rise of temperature causes the fat to liquify, and, when submitted to centrifugal force, it all comes to the surface, and can be measured in the graduated neck of the test bottle.

BABCOCK'S METHOD

was on the same principle, and the next test to be brought out. With this machine, sulphuric acid of a certain strength (specific gravity 1·82) is used, and the bottles, after been turned in the machine for several minutes, are filled up to the neck with hot water, being again whirled for a couple of minutes, when the fat may be read off.

Another method is the Leffmann Beam test, but, as an accurate description of one process will tend to serve for the lot, we will take Dr. Gerber's butyrometer as an example, and describe this process. It has been found, when using sulphuric acid, that, owing to the great rise in temperature when mixed with the milk, some of the fat, with milk sugar, gets charred to a black substance which consequently interferes with obtaining accurate results. To do away with this, amyl alcohol has been found to be the best substance. So that in one or two methods we find this substance always added.

The Gerber test undoubtedly finds most favour in England and Germany, at least at the present time, and, indeed, we may say is decidedly the handiest and quickest method of testing for milk fat, and probably the best of all present-day volumetric tests.

To perform this test is an extremely simple matter, and it may be performed with great accuracy after a few trials, with an ordinary amount of care.

Sampling the milk is of the greatest importance, and if not properly done it is useless to perform the test, as then it would be both waste of time and material.

The milk to be sampled should be thoroughly mixed by tilting (if only a small quantity), say an individual cow's milk, from pail to pail; and when satisfied that the cream is well distributed throughout the whole, a sample may be taken. Milk is best sampled when warm from the cow.

MAKING THE TEST.

The essentials for the test are pipettes of tubes for measuring the acid and milk of the following capacities:—

10 cubic centimetres for acid,			
11	,,	,,	milk,
1	,,	,,	amyl alcohol.

(2) Test bottles fitted with rubber corks.

(3) Chemicals for test.

The sulphuric acid used should have a specific gravity of 1·82, but may be varied a little from this strength without affecting the accuracy of the test.

MEASURING THE QUANTITIES.

First of all, 10 c.c. of the sulphuric acid is drawn up in the pipette. A safety pipette as illustrated is best for this purpose, as it saves very often a blistered mouth, and perhaps, at the same time, a certain amount of strong language.

The air is let in at the top by means of slightly loosening the finger, and the acid let down to the mark, denoting that up to that point it contains 10 c.c.

The test bottle is now inverted in a stand, and the acid run into it. A mistake is here very often made, which is to blow the drop or two of acid remaining in the tip of the pipette into the test bottle. This is, however, wrong, as the pipette is graduated so as to allow of the amount being left in; consequently, when it is blown out, an error is introduced; particularly should this be noticed when measuring out the milk, as a drop or two makes some little difference in the result.

Next is put in 1 c.c. of amyl alcohol (on top of the acid), which will slightly discolour when coming in contact with the acid. The greatest possible care must be observed in measuring the amyl alcohol, as an extra drop or two affects the result most remarkably; indeed, if you must make any error in measurement, make it in the acid rather than in the alcohol or milk.

Next comes the milk, which should be let in from the pipette drop by drop, not all at once, as some so frequently do. Having put in the measured proportions of all the ingredients, the test bottles are corked and well shaken before putting into the rotary machine. The test bottles are now submitted to centrifugal force in the machine for about two to three minutes, when they may be taken out.

READING THE PERCENTAGE OF FAT.

The fat will be noticed to have collected on the top of the liquid—that is, if the test has been properly performed—and should be of a palish yellow colour, although this is not so with the fat of milk under certain conditions of feeding, &c. However, it is generally the case. To read off the percentage, the fat must be brought upon the graduated scale on the neck of the bottle. This is done by pushing in the indiarubber cork.

Get the bottom of the fat layer even with one of the long graduations, or where you see one of the numbers, and then it is a simple matter to read off the percentage. Each space between the number represents 1 per cent., which is subdivided into ten small divisions each equal to 1 per cent. So that if we have three large divisions and five small ones, this would represent 3·5 per cent. fat, the composition of a good milk.

In reading, always see that the bottom of the fat is exactly on one of the large marks, and in reading off the decimal percentage read to the bottom of the meniscus or air-like bubble which is always present on the top of the fat.

In making a test of any particular sample of milk, it is advisable always to make two tests, which should agree in every particular if the testing is properly done and the milk well sampled.

The ash or mineral matter in the milk usually settles to the bottom of the test bottle near the cork in the form of a greyish-white powder.

Very often it happens that in taking out the bottles (after whirling in the machine) the fat is not liquid or clear enough to give a correct reading. This is due to a fall in temperature which has taken place. Especially in cold weather is this the case; and another cause of this is that the strength of the sulphuric acid is not satisfactory, due, perhaps, to some individual unwittingly leaving out the glass stopper of the bottle; and as sulphuric acid has a great liking for water, it absorbs the moisture from the atmosphere, and is consequently depreciated in strength.

To liquify the fat sufficiently for a correct reading, the bottles (with contents) must be placed in hot water of a temperature of about 160 degrees for a few minutes, and then put in the machine and whirled for another minute to bring to the top any fatty particles which remained in the liquid, due to the low temperature at which the test was performed.

PRECAUTIONS IN USING THIS TEST.

It must be remembered that sulphuric acid is of an extremely burning nature, and that if dropped on the clothes is sure to burn a hole in them; in fact, it is quite ridiculous to see the nice white aprons and jackets of dairy students riddled with holes by the careless use of this acid.

Indeed, with novices it is not an uncommon thing to suck up the acid when using the pipette into the mouth, when much spluttering and a fearfully sore mouth results.

A word of warning also in using amyl alcohol, which, although not so dangerous, is extremely nauseous stuff to get into the mouth. Beginners, on account of the extremely small capacity and bore of the 1 c.c. pipette, are almost sure to suck this stuff into the mouth, so that before using the 1 c.c. pipette for amyl alcohol it would be well to get into the way by practising with water.

Clean out the test bottle immediately after using with hot water, and if any fat is left in the neck be sure and get it away with a fine brush provided for the purpose, or it will affect the accuracy of the next test.

Comparing the results of the Gerber test with the Chemist's Gravimetric process—say, Adams—we find that the error is very small, merely nominal, about ·01 per cent. or ·02 per cent., so that those who use this test can be pretty sure of accurate results, the chief feature of this empirical method being dependent on the proper graduation of the test bottles.—*Farmer and Stockbreeder.*

THE STRUCTURE OF THE COW'S UDDER.

The udder of the cow is divided into two chambers by a membrane which runs in the same direction as the backbone. So complete is the division resulting from the presence of this membrane that the milk from one chamber cannot pass into the other. For this reason it is advisable that the milker should operate, say, on the front and hind teats on the side next to him, and, having emptied one chamber of the cow's vessel, should proceed with the other. This is not, however, the general practice. It is customary to operate on the teats of different chambers simultaneously, on the ground that that method of procedure preserves the natural state of the udder, whereas such a contention is quite contrary to facts. These were some of the points upon which the instructor to the Bute County Council recently dwelt with particular emphasis in a lecture delivered at a meeting of dairy farmers which he attended in that part of the county.—*Farmer and Stockbreeder.*

PIG BREEDING AND FEEDING.

So many of our farmers and would-be farmers are now turning their attention towards pig-breeding that too much practical information on the subject cannot be given. We know that there is money in dairy-farming and pig-raising combined; and although those already in the business may understand it thoroughly, there are others who need a few hints, and we therefore republish a chapter from Professor Henry's excellent book, "Feeds and Feeding," on the management of pigs:—

FEEDING BROOD SOWS AND YOUNG PIGS.

In the successful management of breeding stock the prime requisite is ample pasture, that the animals may be maintained in the open air and sunshine, away from pens and yards, during as large a portion of the year as possible. Roaming in pastures covered with nutritious clovers and grasses, the pigs will develop healthy bodies. The pasture will not alone suffice

for nutriment, and should be supplemented by foods especially adapted to bone and muscle building. Pigs of the larger breeds should receive sufficient nutriment to ensure about 1 lb. of growth per day, in order to reach the standard weight of 300 lb. when one year old. The boar should be kept on pasture as much as possible, and when confined should be provided with a lot for exercise. After the growth of the framework is completed, this animal should receive only sufficient food to continue in fair condition, all tendency to grossness being avoided. It is especially important to supply coarse foods, as roots, whole oats, bran, and boiled chaffed clover hay.

FEED THE BROOD SOW.

The feed for the sow before farrowing should be nutritious, but not concentrated. Heavy, concentrated feed stuffs may be extended or given volume by using bran, which serves well for this purpose, and roots, which are much relished, and by supplying chaffed clover or lucerne hay softened with boiling water. Some corn may be fed, but meals rich in protein—oats, peas, middlings, and barley—should supply most of the nutriment. Breeders differ in their management of sows before farrowing, some insisting that they be held in thin flesh, while others would have them in high condition. They will prove satisfactory when in good flesh, provided it is put on under proper regulations as to character of feed and amount of exercise. As farrowing time approaches, let the feed be sloppy, and limited in quantity. Any tendency to costiveness should be overcome by feeding bran, oilcake, meal, roots, or other feeds of a corrective character. For two or three days after farrowing supply only a limited quantity of feed. A thin, warm slop made of middlings, oatmeal with a very little oilcake-meal, poured a little at a time into the feeding trough, will quench the thirst of the new mother and answer all requirements. Eating her young, an act quite common with brood sows, is unnatural, and reflects upon the management of the feeder, indicating that feed and exercise have not been properly regulated.

IMPORTANCE OF EXERCISE.

Sows carrying much flesh, made while confined in small pens, will prove at best unsatisfactory breeders. Exercise is easily secured by the use of pasture, and will tend to keep down unnecessary flesh.

FEEDING SOW AND PIGS.

If all goes well at farrowing time, the feed may be gradually increased after two or three days, with the increasing flow of milk and the growing demands of the pigs, until a full ration is supplied. Brood sows should be heavily fed, for the gains of young pigs are made at low cost for feed consumed. Good brood sows with large litters will usually fall off in weight despite the best of care and feed, but such decrease is no reflection upon the skill of the feeder. In feeding a brood sow, the herdsman can draw upon all feeds at his command. Middlings, ground oats, and cornmeal are particularly useful, and should be liberally supplied; some bran, ground peas, barley, and other grains will also prove helpful. The by-products of the dairy—skim-milk and buttermilk—are always in place, and may be used to almost any extent. Cooked roots, potatoes, or pumpkins, with a liberal admixture of meal, form an acceptable ration.

At farrowing time, as soon as the young pigs have drawn their first sustenance, it is well to at once separate them from the dam, placing them near by in a chaff-lined box or barrel. Sows which have been properly handled before farrowing will not usually resist such separation. Here the pigs are safe from harm, and the attendant can pass them to the dam at intervals of a few hours for nourishment. Mature sows are often so clumsy that unless some precaution is taken they will kill their young by lying upon them. After two or three days the pigs are sufficiently strong and active to be entirely given

over to the care of the dam. Pigs often injure the teats or udders of the sow while sucking, because of sharp teeth. Their mouths should be examined, and the injurious members filed or broken off—a simple operation.

When two or three weeks old, pigs will take a little nourishment provided for them in a separate trough, which should be located at a convenient point in pen or lot, accessible to the pigs, but not to the dam. At first place only a pint or two of feed in the trough, and when this is eaten give more. Skim-milk will be the most relished, but in its absence a thin porridge of middlings or sieved ground oats with a little oilcake-meal will prove satisfactory. Soaked grains of maize scattered over the feeding floor will keep the young things busy and on their feet, getting exercise while securing nourishment. The pigs should be encouraged to eat as much as possible from the side trough.

EXERCISE FOR YOUNG PIGS.

Well-nurtured young pigs often become very fat, and many die unless abundant exercise is provided. If sufficient exercise cannot be given, danger can in part be averted by reducing the feed supply, though by this growth is more or less checked. In the absence of more natural exercise, the herdsman should turn the pigs out of doors two or three times a day and drive them about the yard for a time. Upon the first appearance of scouring or other ailment, the supply of food should be reduced, and the diet changed if possible. Carefully remove all excrement, and change the animals to new quarters if they can be provided.

WEANING THE PIGS.

Pigs are generally weaned when from seven to ten weeks old. This is best accomplished by first removing the two strongest members of the litter to a separate pen, and after two or three days taking away others, always choosing the most vigorous, until all are removed. Under this practice the milk flow of the dam will gradually diminish until it ceases. Many breeders allow pigs to wean themselves—a result reached without difficulty where they are liberally supplied with palatable nourishment at a side trough. When the pigs are weaned they should be placed in groups of not over twenty, care being taken that the members in each group are the same size. Where large numbers of pigs of varying sizes range together, the weaker ones are at a disadvantage at the feed-trough, and are liable to permanent injury from lack of feed and the rough treatment they receive.

Under good management, the period between weaning and fattening the pig is bridged without difficulty. First, let this animal be kept upon natural earth, having the freedom of the pasture as long as possible. There is no better place for the growing pig intended for either breeding or fattening than a wood-lot of mixed herbage or a pasture carpeted with blue-grass, clover, or alfalfa. Pigs should wear no rings in their noses unless much rooting is done, for this cruel restriction works injury to the animal in several ways. While on pasture the shote should still receive feed possessing bulk and carrying a liberal supply of protein for muscle-building and ash for the bones. If these are amply supplied, some maize may be fed without harm. The feeder should aim to keep the pig steadily increasing in weight from one-half to one pound per day, according to the size of the animal.

FATTENING.

Pigs are now prepared for market at all ages, and the feeder should be governed by local requirements. A pig which has been reared on pasture supplemented with feeding stuffs rich in protein and ash can be rapidly and economically fitted for the market. Having been supplied with nutritious, cooling grasses and other plants of the field, the digestive tract of this animal becomes ample in size, healthy, active, and easily able to digest large quantities of feed, the whole system being in condition to assimilate the nutriment supplied and utilise it to the fullest extent.—*Farmer and Stockbreeder.*

Viticulture.

VINEYARD NOTES.

TREATMENT FOR ANTHRACNOSE.

BY E. H. RAINFORD,
Viticulturist, Queensland Agricultural Department.

IN different parts of the colony a considerable number of vines shows attacks of Anthracnose, which vignerons should not neglect, as not only will a considerable amount of fruit be damaged by it, but also the wood for next year's pruning, which may affect next season's vegetation and crop. The best system to adopt with Anthracnose, or Black Spot, is the preventive treatment by sulphuric acid solution, as already explained in the *Agricultural Journal* for August, 1898; but, notwithstanding this precaution, the disease will in certain seasons make its subsequent appearance, and summer treatment be required. For those who require to get rid of this pest the following simple and economical receipts are given:—

	Oz.
Finely divided slaked lime	85
Finely powdered sulphate of iron	15
	100

Finely divided slaked lime	25
Powdered sulphur	60
Finely powdered sulphate of iron	15
	100

Either of the above mixtures should be dusted over the shoots and bunches early in the morning, before the dew evaporates, twice or thrice, at intervals of ten days. It would be well to try both the above combinations in different parts of the vineyard to see which gives the best result. A word of warning—be very careful that the lime is thoroughly slaked, otherwise it may cause burning and scabbing of the leaves and fruit. After slaking, the lime should be left exposed to the air a few days, occasionally turning it.

Tropical Industries.

THEOBROMA CACAO.

BY E. COWLEY,
Manager, Kamerunga State Nursery, Cairns.

NOT a great deal is known about cocoa in Queensland, for little has been grown in the colony. That it can be grown was evinced at the last Cairns Show, when some pods of the fruit were displayed, the same being grown at the State Nursery, Kamerunga. What, indeed, could not Queensland grow? Perhaps the mangosteen and the durian* would puzzle them, but cocoa has been exhibited before now in a Cairns Show. A few years ago the Messrs. Swallow Bros., of Hambledon, showed a pod which puzzled many persons. However, the Messrs. De Moleyn are planting a considerable area in the Russell district, where probably the plant has the chance of thriving better

* Three varieties of mangosteen have been discovered in Queensland—the latest from Cairns. The durian will also flourish where the Jack fruit thrives as it does in Queensland.—Ed. *Q.A.J.*

than in any other part of the colony. It would seem that a humid climate is essential to this plant, and this Russell River climate, according to our Hydrographic Engineer, is the premier of Queensland. Up to the present time it has not been proved that cocoa beans grown in Northern Queensland are fertile, but trials will be made by seeds grown at the State Nursery (Kamerunga) during next year. The rainfall there is on the average about 100 inches a year, but, at times, droughts extend to 30 days. This, of course, is most unsuitable for the cocoa plant. It would seem that there are at least nine varieties of this plant, from Mexico, New Granada, Guiana, &c.

But Mexico, as far as can be gathered, is the cocoa country. Many varieties of things are made from the cocoa bean, including spirituous liquors, &c., which have been shown at various international exhibitions. Simmonds tells us: "When Cortez and the Spaniards entered the vast kingdom of Moctezuma they found the use of cocoa and chocolate as a beverage very common. The Emperor, however, alone drank it flavoured with vanilla from a golden cup." Simmonds also says: "Cocoa or chocolate is without exception, of all domestic drinks, the most alimentary; and the Spaniards esteem it so necessary to the health and support of the body, that it is considered the severest punishment to withhold it even from criminals—nay, to be unable to procure chocolate is deemed the greatest misfortune in life."

It would seem that coffee-drinkers such as the Americans overtake the Spanish cocoa-drinkers, notwithstanding what Simmonds says. We all esteem cocoa as a beverage, and the various cocoa manufacturers in Europe vie with each other in making it up into almost innumerable shapes and forms.

That the pods can be grown in Queensland has been proved, but will their production be of economic value? Certainly there is no reason why every planter or farmer in North Queensland should not have a few trees in his garden or orchard. It is probable that some seed will be available at Kamerunga next year. One thing has been ascertained at that nursery about *Theobroma Cacao*. It should be left unpruned. Trees that have been pruned have not, up to the present, borne fruit, whatever they may do hereafter. The overseer thought some of his plants looked unsightly, and cut away a quantity of branches. The result was that an extraordinary number of branches sprang out from the primary branches and stem, and have yielded no fruit, nor do they seem likely to do so; so, perhaps, it would be as well to allow Nature to have her own way in Queensland, and probably experience will teach.

It would be, of course, little short of folly for persons to go in expressly for cocoa-growing at the present stage. The Messrs. De Moleyn will demonstrate, probably, which is the best part for the cultivation of this plant in North Queensland. Individuals may well await the result of their trial. It is probable that the area of land between the Johnstone and Mulgrave Rivers, which has the largest rainfall in the colony, will be most suitable for the trial. It is understood that the Sandeman Syndicate Company, as well as the Messrs. De Moleyn, are doing their best in this strip.

MANURING OF TROPICAL PLANTS—COFFEE.

Deep, loamy soils, rich in humus, are best suited for the cultivation of coffee; alluvial soils mixed with humus, or sandy loam soils, rich in humus, might also prove suitable, but soils which are either light and sandy, heavy clay, or deficient in lime, should certainly be avoided. As the results of experiments made upon this plant indicate that even the most extensive application of artificial fertilisers does not compensate for a deficiency in humus, it should be the constant aim of the planter to supply coffee-fields with humus-producing substances. The very first place should, therefore, be given to fertilisation with stable manure and compost, or, when these methods cannot be resorted to, they might be replaced by green manuring. The necessary quantities of nitrogen, phosphoric acid, and potash (and sometimes also of lime and magnesia) must be supplied in the form of mineral fertilisers, as manuring with

humus-producing substances alone does not answer the plant-food requirements of the coffee plant. The application of mineral fertilisers becomes absolutely necessary whenever a soil has been under cultivation for some time, and its natural supply of plant-food has become depleted.

The plant-food requirements of the coffee plant have been thoroughly investigated by Dr. F. Dafert,* Director do Instituto agronomico do estado de São Paulo, Campinas. As a result of his extensive studies, he compiled the following figures, giving the plant-food requirements of the average coffee-tree upon an average soil :—

	Lime.	Magnesia.	Phosphoric Acid.	Potash.	Nitrogen.
In the 1st year ...	0·057	0·019	0·119	0·013	0·215
,, ,, 2nd ,, ...	0·253	0·089	0·433	0·120	0·271
,, ,, 3rd ,, ...	3·434	1·150	6·292	0·653	6·345
,, ,, 4th ,, ...	5·030	1·574	9·805	1·041	10·674
,, ,, 6th ,, ...	12·425	3·910	21·673	2·390	18·106
,, ,, 10th ,, ...	11·268	3 619	16·011	1·778	18·066
,, ,, 40th ,, ...	4·138	1·283	6·056	0·663	5·538

The roots, stems, and branches were carefully weighed, and the following quantities of coffee beans used as a basis for the yields :—

4 year old tree	3·5274 oz.
6 ,, ,, ,, ...	17·6370 ,,
10 ,, ,, ,, ...	35·2740 ,,
40 ,, ,, ,, ...	7·0548 ,,

When we consider, however, the fact that in tolerably well-cared for gardens an abundant use of fertilisers results in a correspondingly increased yield, requiring proportionately larger quantities of plant-food for the formation of wood and leaf, it becomes evident that the actual plant-food requirements of this plant are considerably greater. Dr. Dafert therefore recommends the following quantities of plant-food ingredients to be applied to each tree per annum :—

	Phosphoric Acid.	Potash.	Nitrogen.
Trees 0—4 years old ...	0·040 oz.	0·378	0·158
,, 5—8 ,, ,, ...	0·313 ,,	1·231	0·571
,, 9—20 ,, ,, ...	0·252 ,,	0·734	0·462
,, over 20 ,, ,, ...	0·152 ,,	0·488	0·081

In this way the formation of wood and leaf necessary for the rapid development of the tree is promoted, in the first few years, by extensive nitrogen and potash fertilisation, and later on the fruit is aided in its formation and development by larger quantities of phosphoric acid and potash. It is therefore apparent that the principles laid down for other fruit-bearing trees (apples, pears, oranges, lemons, &c.) apply also to coffee.

As a complete absorption of the plant-food ingredients contained in the fertiliser cannot be expected, it is absolutely essential that the quantities applied should be increased in proportion to the nature and condition of the soil.

Fertilising experiments with coffee plants are neither so numerous nor satisfactory as to enable us to draw correct conclusions regarding the various questions involved in the proper fertilisation of the plant.

Several years ago, Dr. Dafert inaugurated some strictly scientific experiments; they are not yet far enough advanced, however, to show the effect of the various plant-food ingredients upon the yield, although striking differences in the development of the young plants can easily be recognised at this early date.

1. The presence of humus-forming substances (stable-manure, compost, coffee-shells, &c.) produces a beneficial effect, although, when used in combination with artificial fertilisers, their availability becomes considerably increased, in proportion as the soil itself is deficient in humus.

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* "Landwirthschaftliche Jahrbücher," 1894, p. 27, and Dr. Dafert, "Bemerkungen über rationelle Kaffeekultur," Berlin, Parey, 1896.

2. The application of mineral plant-food ingredients produces a better effect upon soils rich in humus than upon those deficient in this substance.
3. The application of natural fertilisers gave the best results upon soils rich in humus; in this case the addition of artificial fertilisers had no effect. It should be mentioned, however, that potash and phosphoric acid always produce a beneficial effect upon the development of fruit.

Dr. Dafert makes the following suggestions (regarding the fertilisation of older, *i.e.*, bearing trees), which are based upon numerous observations:—

1. Caution should be exercised in fertilising coffee with pure lime or magnesia, as the presence of these substances in large quantities will injure the growth. The maximum application has not yet been definitely ascertained.

2. It has been shown conclusively that, in order to grow coffee to the best advantage, it is best to apply the easily soluble fertilisers, especially the potash salts, at different times and in small doses, as the application of a large quantity at one time is not good for this plant.

3. Organic fertilisers, not thoroughly decomposed, are apt to injure the plant. The greatest caution in this respect should be exercised in the use of animal substances, though the effect produced by vegetable substances also varies in proportion to the stage of decomposition.

4. Sickly trees must be made accustomed to easily soluble, strong fertilisers gradually—*i.e.*, it is advisable to begin with very small doses, which should be gradually increased. (This is recommended by Dr. P. Wagner for garden-plants and fruit-trees.)

5. One-sided fertilisation—*i.e.*, the application of only one ingredient—(a very popular method with many planters) has seldom been of practical benefit. The application of nitrate of soda, for instance, almost always brought about a luxurious development of the plant, but the formation of fruit suffered. It is, therefore, advisable not to overlook the necessity of the simultaneous application of all the plant-food ingredients.

6. No results are at hand regarding the question as to whether it is better to apply sulphates or chlorides, nitrate of soda, or sulphate of ammonia.

To the question what kind of fertilisers should be applied, Dr. Dafert gives the following answer:—

Natural, especially organic, fertilisers produced upon the farm (the quantities of which should be systematically increased, wherever possible), and in addition artificial fertilisers, should be applied to coffee. Where diversified farming (with dairying) is absolutely impracticable, green manuring can be resorted to.

The slowly soluble artificial fertilisers, such as Thomas' slag, guano, bonemeal, &c., should be applied to rich soils, and especially where it is desired to supply the soil for several years. Easily soluble materials, such as acid phosphate, nitrate of soda, sulphate of ammonia, and all of the potash salts, should, on the other hand, be applied when—

1. It is desired to produce a rapid improvement in exhausted or weakened plantations, and to raise them to a state of the highest productiveness;
2. Coffee is to be cultivated on very poor but otherwise well-situated soils;
3. It is desired to correct some errors, as, for instance, deficiency of nitrogen in the case of poor sprouts, or deficiency of potash in case of insufficient fertility;
4. It is desired to counteract slight defects in climate (cool location).

Dr. Dafert, in this connection, gives the following directions for the proper fertilisation of the coffee plant, in which an annual application of from 2·2 to 8·8 lb. of stable manure or compost to each tree is taken as a basis:—

For Trees in the first 4 years of Growth.	For Trees from 5-8 years old.	For Trees from 9-20 years old.	For older Trees.
A.—EASILY SOLUBLE MIXTURES:			
4·5 lb. double superphosph. (40 per cent.) 34·3 ,, muriate of potash 47·8 ,, nitrate of soda 13·4 ,, plaster	11·1 lb. double superphosphate 34·9 ,, muriate of potash 54·0 ,, nitrate of soda	14·3 lb. double superphosphate 33·3 ,, muriate of potash 52·4 ,, sulphate of ammonia	21·5 lb. double superphosphate 55·4 ,, muriate of potash 23·1 ,, sulphate of ammonia
Each tree should receive per annum... ... ... *8·8 ounces.*	*28·2 ounces.*	*17·6 ounces.*	*7·1 ounces.*
B.—SLOWLY AVAILBLE MIXTURES:			
1. UTILISATION OF THE COFFEE-SHELL ASHES.*			
58 lb. dried blood 2 ,, Thomas' slag 31 ,, coffee-shell ashes 9 ,, plaster	56·9 lb. dried blood 30·7 ,, coffee-shell ashes 2·0 ,, bonemeal 10·4 ,, Thomas' slag	60·8 lb. dried blood 9·1 ,, Thomas' slag 24·9 ,, coffee-shell ashes 5·2 ,, bonemeal	24·4 lb. dried blood 15·4 ,, Thomas' slag 48·0 ,, coffee-shell ashes 12·2 ,, bonemeal
Each tree should receive per annum ... ... *24·7 ounces.*	*15·9 ounces.*	*12·3 ounces.*	*3·5 ounces.*
II. UTILISATION OF OILCAKES.			
56 lb. castor cakes 30 ,, dried blood 3 ,, Thomas' slag 5 ,, muriate of potash 6 ,, plaster	45·9 lb. castor cakes 25·0 ,, dried blood 10·3 ,, Thomas' slag 18·8 ,, muriate of potash	51·8 lb. castor cakes 23·5 ,, dried blood 10·6 ,, Thomas' slag 14·1 ,, muriate of potash	29·1 lb. castor cakes 12·9 ,, dried blood 26·4 ,, Thomas' slag 31·6 ,, muriate of potash
Each tree should receive per annum ... ... *35·3 ounces.*	*22·9 ounces.*	*17·6 ounces.*	*5·3 ounces.*

* The burning of the dried coffee-shells is by no means advisable, because the ashes contain only potash and phosphoric acid, losing the more valuable nitrogen. On the other hand, it pays to apply the shells directly or in combination with other substances in the form of a compost.

Dr. Dafert remarks :—

1. In case it is desirable to replace one or the other of these materials by some equivalent substance, the tables of composition in Part I. should be referred to.
2. Where stable-manure, compost, &c., are not available, an increased artificial fertilisation must be resorted to. Either the application of the easily soluble mixtures must be doubled, or they may be used in combination with more slowly available mixtures; in the latter case, Thomas' slag especially should be taken into consideration.
3. When the condition of the soil is abnormal, the above formulæ must be altered. For instance, it is wasteful to apply plaster to calcareous soils; soils rich in potash require a much smaller quantity of this ingredient than that recommended above. If the soil is deficient in phosphoric acid, the percentage of this ingredient in the mixtures must be increased.
4. The age limits given in the table should be changed to suit varying conditions, the figures being mean values and intended for average trees.

SUCCESS OF PROPER COFFEE FERTILISATION

Though the number of reliable observations regarding the effect of the applications recommended above is not large, the examples given below will convey an approximate idea of what can be accomplished by means of a rational cultivation of the coffee-plant.

In 1893 the Agricultural Institute of the State of São Paulo assumed the management of an almost abandoned sixteen-year-old plantation, the returns from which scarcely covered the cost of harvesting. This field was of special interest to the institute, as many million coffee-trees in Brazil are in a similar, if not poorer, condition. The plantation was first carefully cleared, and its yield determined. The yield from 5,512 trees in 1893-94 was—

	1,426·57 gallons coffee	=	1,786·8 lb. bean-coffee,	
or per tree	1·04 quarts ,,	=	0·33 ,,	,,

Immediately after harvesting, the poorer trees were fertilised with half of the quantities given in the table, and the soil thoroughly cultivated. At the end of three months, the soil had improved considerably, the blossoms were especially numerous on the fertilised trees, and the development of fruit was normal.

These 5,512 trees yielded in 1894-95—

	7,483·36 gallons coffee	=	9,911·9 lb. bean-coffee,	
or per tree	5·39 quarts ,,	=	1·79 ,,	,,

In 1893-94 the average value of the yield from each tree was 25 pf. The expenses amounted to somewhat over 43 pf., and the loss was therefore 18 pf.

In 1894-95 the value of the yield from each tree was 134 pf., while the total expenses did not amount to more than 44 pf.—*i.e.*, every tree produced a profit of 90 pf. The fertiliser applied to each tree was worth 16 pf.

This is only the beginning, and, judging from the present favourable condition of the plantation, the next yield will be at least double that of the previous year.

Dr. James Warne, of Itapira, Brazil, inaugurated a more intensive system upon his farm ten years ago, and procured—

82,672·5 lb., or about 7·7 lb. of bean-coffee

per tree, from 15,000 partly (two-thirds) very old trees, by means of fertilisation with stable-manure.

During the last few years, artificial fertilisers have been largely used, although not to the exclusion of other manures; the mixtures were similar to those used in Campinas, but the percentage of nitrogen was higher. The

average yield per tree was 5·95 lb. Some of the trees to which only stable-manure had been applied, as well as others which had received both stable-manure and artificial fertilisers, produced 26·5 lb., some of the latter producing even as much as 33 lb.

Mr. G. J. Hockmeyer obtained very good results upon his plantation, Las Mercedes, in Guatemala, with a mixture of—

47·4 per cent. nitrate of soda,
31·6 per cent. sulphate of potash, and
21·0 per cent. double superphosphate.

No exact figures regarding the yield are given.

Mr. A. Brunner, Helyana Landen (Sumatra) reports that when coffee-seedlings had been artificially fertilised they could be transplanted at the end of six months (with one or two branches); as a rule this is not possible until a year has elapsed.

As regards the manner of applying the fertiliser materials, little need be said.

In laying out new plantations, it is best to mix the fertilisers with earth in the holes, which must be deepened and enlarged accordingly. In the case of older trees, the fertilisers should be applied as far as the roots may extend, and turned under. In order to ensure the best distribution of the materials, they should first be mixed with earth; the proper quantities of this mixture intended for one tree should then be measured off in some vessel (old tin cans will answer the purpose).

Broadcasting over the field is injudicious, as it would necessitate the application of much larger quantities.

GROUND COFFEE.

It is tantalising to think of what the consumption of coffee might be as compared with what it is. Advertising and canvassing is less wanted than honesty. It is adulteration that lessens the demand for coffee. It has a twofold effect:—(1) It deprives the product of its reputation, for a decoction that should be fragrant and comforting if made from pure coffee is not so when made of the adulterated stuff sold under that name; and (2) it lessens the offtake of coffee by substituting something else under its name. A few examples will suffice to show the variety of adulteration that is still practised. These are taken from the report of Professor Cochran to the Department of Agriculture at Washington on his analyses of a large number of samples of "ground coffee" and "ground-coffee compounds," selected in Eastern Pennsylvania. Here are some of the "compounds" that are sold as *coffee*:—

Composed of bran, cracked wheat, and a little caramel; chiefly wheat-bran sweetened and roasted.

Sample bears about the same relation to coffee as wheat screenings do to wheat.

Roasted sweetened wheat, 75 per cent.; coffee, 25 per cent.

Composed of the roasted and rather finely broken grains of wheat and barley.

Sample is composed chiefly of wheat bran.

Composed of roasted cereals and husks of cocoa-beans.

Coffee, about 64 per cent.; pea hulls, 13 per cent.; and chicory, 23 per cent.

Sample is roasted rye.

Sample is roasted barley.

Sample is composed of wheat, chicory, coffee, and peas coarsely ground.

Composed of peas, about 69 per cent.; grains, 29 per cent.; and chicory, about 2 per cent.

Sample is composed of bran, cracked wheat, chaff, and caramel.

Sample is composed of wheat, chicory, coffee, and peas, all coarsely ground.

Of all the samples examined, but four were found to be composed of pure coffee; and of these, three were pronounced to be of "very inferior quality."—*Planting Opinion.*

COFFEE IN BRAZIL.

Brazil is the great coffee country of the world. More than 60 per cent. of the coffee placed on the world's markets come from this great South American republic. The plant is grown here from the River Amazon to the Rio de la Plata, but according to *Planting Opinion* the true coffee zone is confined to the States of Rio de Janeiro, Sao Paulo, Espirito Santo, and Minas Geraes, Sao Paulo being the banner coffee State. This coffee finds its outlet at the ports of Santos, Rio de Janeiro, and Victoria.

Business Methods.—A publication of the National Association of Manufacturers has the following on the methods of doing business at Rio de Janeiro and Santos:—

Rio de Janeiro and Santos are the principal ports from which coffee is shipped. The manner in which the coffee business is conducted in Rio is somewhat different from the method followed in Santos, and a few remarks on the subject may be of interest. In Rio the *commissarios*, or planters' agents, sell to the *ensaccadores*, or intermediates, who classify and sack the coffee. Each coffee-exporting firm employs its own brokers to buy from the intermediaries. The broker's interest, therefore, is to act solely on behalf of the exporter, and, as he is well posted on the stock and requirements of the market, and as the intermediaries have the coffee ready for sale, duly classified, he can generally procure the exact number of bags of any type he may be instructed to purchase.

It is not so in Santos. There the planters' agents sell direct to the exporting houses, employing their own brokers. The latter's interest is, therefore, with the growers. The coffee is not classified as in Rio, but is simply sold in lots. An exporter who has to execute an order for a certain type of coffee may have to buy in excess of his needs, in order to be able to separate and obtain the quality and quantity required. The remainder, should it not be of a standard suitable for shipment, must be disposed of in the market. In either case the exporter naturally regulates his invoices so as to cover any loss the transaction may entail. It will be seen that with greater capital and the employment of thorough experts to buy the coffee, the Santos market offers every inducement to exporting houses. They would not only save profits, by saving the intermediaries' commission, but often, by careful selection and judgment in shipping, surpass their expectations.

Coffee Grading.—Coffees are graded in this market as follows:—

Fine.—Consisting of clean coffee of regular bean.

Superior.—Bean regular in size, but may contain a few husks or black beans, called "quakers"—sticks, stones, and dirt not allowed.

Good.—Evenness of bean not absolutely insisted upon; may be black beans or husks, and even a few broken beans, sticks, stones, and dirt excluded.

Regular.—In this grade defects appear, large quantities of black beans, hulls, stones, sticks, or dirt.

Ordinary.—Contains foregoing defects and some broken beans.

Triage.—The last or lowest of grades, is made up of broken beans, and has all the other defects enumerated.

In the vernacular (Portuguese) these six grades are *fino*, superior, *bom*, regular, *ordinario*, and *escolha*. The berry is sometimes coloured before shipment, and sometimes milled. The export firm of Rose and Knowles is successful, and another mill is being built, whose owner proposes to mill 500,000 bags (66,000,000 lb.) a year. Coffee, for the Cape of Good Hope, for example, is artifically coloured black to meet the taste of that market. There are two classes of beans—flat and round; and this determines the classification of the berry. The former is the Java, the latter the Mocha type. The round pea-berry, or Mocha type, represents 3 to 6 per cent. of the production. It is graded to-day 2 milreis above the "base" or standard price. The same tree produces both varieties.

RAMIE FIBRE.

THE *Kew Bulletin*, treating of the Ramie industry, says :—

Few practical problems have consumed so much time and energy as the attempt to bring China-grass and Ramie into use for manufacturing purposes. Notwithstanding all the expenditure of mechanical skill and inventive ability, the conclusion cannot be evaded that we are still as far off as ever from being able to place upon the market a finished product which will effectually compete with silk, flax, and the better qualities of cotton.

The plants can be grown with the greatest ease. But when the problem of treatment is solved, the supply of the raw material will be limited to warm countries. The cultivation of China-grass in temperate regions will never be able to compete successfully with that of Ramie (or perhaps of China-grass) in the tropics. It is known that when ribbons can be produced sufficiently cheaply, these can be degummed and turned into filasse at a small cost. The whole question then still turns, as in 1888, on the production of ribbons. We are still waiting for a decorticator which will not merely turn out ribbons fit for further manufacturing processes—that has been accomplished—but will turn out, say, half-a-ton a day at a small cost. Till this has been found, the planter cannot profitably deal with his crop, and the degumming processes. now almost entirely dependent on hand-clean fibre from China, are paralysed for want of a supply which will allow the finished product to compete with other fibres.

The ribbons must be susceptible of being delivered to the degumming factories at a cost not exceeding £7 to £9 per ton. This would pay the planter if he had a decorticator which would leave a profit. At present he cannot produce ribbons under £12 to £15 a ton.

Then the degumming processes should turn out filasse at a total cost of £36 to £40 per ton. At this price the demand would be considerable, and a large and prosperous industry would result. To put the position in other words, filasse must be put upon the market at about 4d. per lb. To use the words of one of the speakers in the discussion at the Society of Arts, "unless it could be brought down to something like the price of cotton or flax, it was impossible to make any profit out of it."

RHEA.

THE time for planters in India and the East, generally, to seriously take in hand the production of Rhea fibre, has now fully arrived, and we hope, in the very near future, to receive more numerous inquiries from our readers as to the best means of disposing of prepared filasse. For some time several factories in England and America have been engaged exclusively in manufacturing all kinds of textile fabrics from the fibre, and there are unmistakable signs that a fine future awaits the new industry. In addition to a profit obtainable from

the preparation of the fibre, however, there are several other good points about Ramie cultivation. Besides being perennial, the plant requires absolutely no cultivation beyond thinning out (and the thinned-out plants may be at once replanted in new ground) after attaining a height of three feet; the original root survives for thirty to forty years; the leaves are greedily eaten by cattle, and are highly nutritious; and the best means of propagation are from root cuttings. Planters need lay out but little capital on this product, as the stalks are marketable without degumming, or additional profits may be realised by doing the degumming and fibre-extraction on the estate. Thus, on the lowest computation, a return of £18 per acre is certain, with the expenditure of the minimum of labour and capital.

If actual results are required, here they are! Upon an estate in Mexico the outturn of cleaned fibre, in 1896, was 1,936 tons, and the price obtainable in New York was 250 dollars (£25) per ton. The total cost of cultivation and laying down in New York, including £5,550 (nearly £3 per ton) for carriage and insurance, amounted to 203,007 dollars (Mexican), and the working capital was increased to 233,007 dollars by 30,000 dollars expended on machinery. After deducting 27,830 dollars for commissions, the net profit reached 326,692 dollars, or 145 per cent. on the working capital. Such results leave ample margin for repayment of interest upon cost of land, and actually make it possible to repay the purchase money within a very short time, and still have left an estate bringing in a handsome profit, especially in countries where land is cheap.—*Produce World.*

Forestry.

TESTS OF WESTERN AUSTRALIAN TIMBERS.

(*From Practical Engineer*, 18*th November*, 1898.)

SOME interesting tests of the three principal Western Australian timbers—jarrah, karri, and red gum—have been recently carried out by Mr. W. H. Warren, M.I.C.E,, Professor of Engineering at the University of Sydney, with a view to showing their physical properties for application in engineering and building construction, with the following results:—

Name of Wood.	Jarrah.	Jarrah.	Karri.	Red Gum.
	lb.	lb.	lb.	lb.
Weight of specimens, per cubic foot	56·2	67·8	59·9	66·2
Ultimate tensile strength, per square inch—				
Specimen A	18,026	11,672	13,920	22,725
" B	17,392	17,197	...	...
" C	...	...	...	...
Compressive strength, breaking load, per square inch—				
Specimen A	5,889	7,880	6,251	6,174
" B	6,030	7,559	8,013	5,679
" C	...	...	...	...
Transverse strength, modulus of rupture, per square inch—				
Specimen A	14,125	15,775	9,946	11,728
" B	12,060	16,625	9,387	13,975
" C	12,687	14,500	11,117	6,515
Shearing strength, breaking load, per square inch—				
Specimen A	1,847	1,911	1,401	1,592
" B	1,783	1,973	1,370	1,521
" C	...	...	...	...

Jarrah is undoubtedly the most valuable, and, at the same time, the most plentiful timber-tree of Western Australia, its durability in seawater and underground rendering it eminently suitable for piles and railway sleepers, for which, and for street-paving blocks, it is already largely employed. The present price of jarrah in London is 2s. 3d. to 2s. 6d. per foot (cube). The growing importance of the export timber trade of Western Australia, which consists almost exclusively of jarrah and karri, is well shown by the following values of the timber exported for the years named—*i.e.*, for 1895, £88,146; 1896, £116,420; and for 1897, £192,451. Some interesting specimens of this wood are to be seen in the Australian Gallery of the Imperial Institute, one of which is a portion of a pile which was for thirty years in Bunbury Harbour. There is also a portion of a plank removed in 1895 from the Upper Brunswick Bridge, which was erected in 1862, and a beam from the roof of St. George's Cathedral, Perth, which was erected in 1844; this beam was removed in 1895. Parts of the surfaces of all the specimens have been planed up and polished, and to all appearances the timber, in every case, is perfectly sound and fit for many more years' service.

Pisciculture.

THE GOURAMI.

MR. D. O'CONNOR, who, it will be remembered, was most successful in introducing live *Ceratodi* from the Burnett district into London and Paris, has, after one failure, succeeded equally in bringing to Queensland the Gourami of Java. Some seventy specimens have lately arrived in the colony, and will by this time have been placed in suitable lagoons and waterholes. Readers of the *Journal* will find an illustration of and some remarks on this valuable fish in the number for October, 1897 (page 340).

In Ceylon great interest is being manifested in the introduction of the Gourami to the waters of that beautiful island.

From the *Tropical Agriculturist* (Colombo) we take the following letters to the editor on the subject:—

Mr. G. M. Fowler writes from Ratuapura—

THE INTRODUCTION OF THE GOURAMI FISH INTO CEYLON.

I am glad to see that the Gourami is again attracting attention. Several attempts have been made to introduce it into Ceylon. Some were imported by Sir William Gregory, which arrived safely, and were placed in ponds in Kandy; but, so far as I can learn, were no more seen. Another attempt was made later (by Mr. Le Mesurier, I believe), and a solitary specimen was to be seen for some time in the basin in the Gordon Gardens, Colombo. In 1894, with the kind assistance of Messrs. Bois Bros. and of the late Captain Bayley, I obtained a consignment from Mauritius. They were most carefully shipped and cared for *en route*, but most unfortunately were all sent off to Nuwara Eliya at once on arrival, and next morning all were dead.

Messrs. Scott and Co., of Mauritius, had warned us that it was doubtful whether the fish would thrive in such a cold climate, and we had intended to distribute them at different elevations. I intended to try again, but was moved elsewhere a few weeks later.

The Gourami has been introduced into India, and the hon. secretary of the Nilgiri Game Association told me that it had been a great success. I believe that it is quite common in Java.

C. D. says—

It is said that the Gourami may be inferior from a sportsman's point of view, but otherwise is by far the more important fish, and could in a few weeks be established by transporting a couple hundred live fish, which should prove neither very difficult nor costly.

The Gourami is supposed to have spread from Cochin China, which is given as its native habitat, and where, existing in a wild state, it is found up to 100 lb. in weight. In other countries the fish domesticated, and, being kept in captivity, is usually marketed before it is 12 lb. in weight—when, no doubt, it proves better eating and is more profitable than when larger. Many consider the Gourami the finest of all fish. The flesh is of a pale-straw colour, firm, flaky, and very delicious.

The fish is said to be very tenacious of life, being generally taken to the market alive, and if not sold returned to the water. It is described as being very hardy and growing fast—mainly a vegetable feeder, but eating any form of waste food. Any one with a pond in his garden can keep the fish, and a scoop net is only necessary when one is wanted for dinner. A writer says that it would be difficult to find a new industry which would yield such satisfactory results to anyone who owns water, such as a pond or lagoon, as the cultivation of Gourami. For the above facts I am mainly indebted to Mr. D. O'Connor, a Queensland authority on pisciculture.

The scientific name of the Gourami is *Osphromenus olfax nobilis*. Besides being so commonly found in Mauritius as well as Java, it has been established in many other parts, and is found in the tanks of Calcutta, Madras, and the Nilgiris, where it attains 20 lb. or more in weight, and is considered excellent eating when kept in clean water.

Dr. Watt, writing a few years ago, says that there the Government of India were considering the introduction of a Fisheries Bill, to remedy the wholesale destruction of fish, by preventing fish-poisoning, regulating the size of net fish, guarding the mouths of irrigation canals against the entrance of fish, levying a tax on the use of fishing implements, &c.

It is said that the Scind fresh-water fisheries in 1882-3 yielded a revenue of 92,541 rupees; and in Burma, in 1883, 12 to 13 (over £100,000) lacs of rupees were netted—and these instances are given as arguments in favour of the introduction of a Fisheries Act into other provinces of India, and why not also into Ceylon?

We read that Mr. D. O'Connor lately arrived in London with four specimens of the *Ceratodus* peculiar to Queensland, which he succeeded in keeping alive. Two were purchased by the London Zoological Society for £90, and he was offered £100 if he delivered the other two alive at the Jardin des Plantes, Paris.*

Mr. O'Connor has determined that on his way back to Queensland he will bring living Gourami from Java or Mauritius, as he considers that Queensland waters are eminently suited to the habits of the fish, which he expects to very easily acclimatise. The Mauritius Government were inquiring after Sinhalese cattle a little time ago: why should not the Ceylon Government see about getting over some of the Mauritius fish?

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* Mr. O'Connor was successful in landing his fish alive in Paris.—Ed. *Q.A.J.*

General Notes.

TUBERCULOSIS AND OUR MILK SUPPLIES.

THE second Harben Lecture on Tuberculosis was delivered at the Medical Examination Hall, Victoria Embankment, last month, by Sir Richard Thorne Thorne, K.C.B., on the subject of the administrative control of our milk supplies in relation to tuberculosis in man. He reverted to the fact during the last half-century there has been an immense reduction in the death-rate from many forms of tuberculosis, notably phthisis, in connection with great sanitary improvements that had been effected, and he now pointed out that infants and children must, according to all experience, have benefited correspondingly. But, when we came to examine the death-rates from *Tabes mesenterica*, a form of tuberculosis, in which the infection is received into the alimentary canal instead of the lungs, it was found not only that all the gain attained at other ages had been lost in the case of children and infants, but that, in addition to this, there had been a very heavy increase in deaths from this cause under one year of age. This increase had gone hand in hand with a steady increase in the consumption of cow's milk as a food in this country—English people being almost the only civilised nation in the world who habitually consumed uncooked milk. He then showed from official returns how large was the amount of tuberculosis amongst milch cows; and, quoting the report of the Royal Commission on which he had served, he explained that the artificial conditions under which milk was now produced in cow-houses, which the animals sometimes never left for a moment during a period at times reaching a whole year, were precisely those most certain to produce that increase of this disease in cows which had been going on. Fortunately, the immediate danger to man was limited to the existence of tuberculosis in the cow's udder; but the early stages of this were most difficult to detect, and it was a form of tuberculosis which tended at times to spread with great rapidity. The danger to man, and especially to our infant population, was one of real gravity, and the loss of child life due to this disease in milch cows was appalling. He did not recommend, as some had done, the removal of every tubercular cow from our dairies and cowsheds, for this, at the lowest estimate, would mean the removal at once of over half a million cows from our milk supply; but all cows with advanced tuberculosis in any part of the body, and all cows with suspicious udder disease, should be at once seized and slaughtered. Amongst the most prominent of remedies was the provision of adequate cubic and floor space in cowsheds, so as to ensure proper ventilation; and he showed that this was often more necessary in country than in town cowhouses, because the latter are often much more under control than the former. Both in Liverpool and Manchester the number of samples of milk containing tubercle bacilli was far greater in country milk than in that obtained in those cities themselves. He further advocated frequent and systematic inspection of cowsheds and dairies by expert officials. As regards compensation for animals seized, his views were not the same as those which he had expressed against any such payment from public funds in the case of the seizure of tuberculous carcasses voluntarily put on sale by the butcher. In the case of the milch cow, the milk alone was placed on sale; and, whilst the use of the milk should be stopped, the cow might be perfectly good and of value for feeding purposes to be sold as meat; and whatever value attached to a cow in this sense should be repaid if the animal was seized and slaughtered by the local authority. He further maintained, as he did in the case of our meat supplies, that any stringency of control over

home supplies should, as far as practicable, be also maintained over imported milk and milk products, as, for example, by appointing inspectors at our ports and by chemical and bacteriological examinations of the materials imported; the whole expense to be borne by a small tax on all such articles as were imported. Incidentally he referred to the success attained in the diminution of tuberculosis in cows in Denmark by the aid of the tuberculin test. And, finally, he most strongly urged that English people should be educated to acquire the habit of cooking their milk before using it. He set aside the ordinary objections raised to this proposal, and he showed that if milk were boiled for a single instant the danger of tuberculosis would be gone, and a cause of thousands of deaths every year amongst children and young adults would be removed. He appealed to the medical profession to use their great influence in effecting this education, and in thus diminishing the waste of human life which resulted from the use of uncooked milk.—*Standard.*

EARLY-FRUITING ROSELLAS.

Mr. E. R. Brotherton, of Newlands, Yandaran, Bundaberg, sends us a sample of rosella fruit, which was gathered on the 27th December. The seed from which this fruit sprang was sown in the last week of September. Mr. Brotherton has grown rosellas for the past twenty years, but never yet had gathered fruit before Christmas. This production of fruit in three months before Christmas must be considered abnormal. The Government Botanist, Mr. F. M. Bailey, to whom the fruit was shown, expressed his opinion that it was a remarkable instance of early fruition, which occasionally occurs with other fruits than the rosella.

CURE OF MANGE IN HORSES.

Mr. W. Mewes, farmer at Emu Vale, writes *re* cure of mange in horses:—I was troubled greatly with mange in my horses the summer before last. I applied the following simple remedy, and got rid of the pest completely in five or six weeks. I waited, before writing to you, to see if the disease was going to reappear this summer. It has not done so, hence I can vouch for the remedy.

Recipe.

Strain the water in which potatoes have been boiled into a bucket, and allow it to cool. Mop the affected parts at mid-day and evening copiously with this potato water. Three times each day will hasten the cure. The mange will disappear before six weeks.

We gladly welcome any remedy which has proved itself effectual, but would advise those who think they have found a certain cure for this annoying disease to follow the example of Mr. Mewes, and wait for developments before announcing an infallible remedy.

SULLIVAN'S EARLY PROLIFIC WHEAT.

An exceptional crop of wheat is said to have been grown by Mr. John A. Kennedy at Albury, New South Wales. The grain is a great size, beautifully formed, and very clean. The heads are of enormous size, and are simply giants in general make-up. The surprising part of it is that in some instances thirteen of these heads came from a single grain of wheat. One expert in Sydney to whom we showed our sample says he has never seen anything to approach this wheat for size and quality. He called in his assistant from an adjoining office, and said to him, "Look at this, my boy; you'll never have another chance to see wheat like that as long as you live." The variety is

known as "Sullivan's Early Prolific," and it is grand wheat. Mr. Kennedy has cultivated his land properly, or else it is hardly likely that he would have had such a grand crop, even from this undoubtedly prolific variety. There's no doubt that farmers will be anxious to get some of the grain from Mr. Kennedy for seed; and as the wheat is being thrashed with a roller, it ought to be in good condition. We forgot to say that the sample we received from Mr. Kennedy was not picked, but represents a fair sample from the whole bulk—and there wasn't a faulty grain in it.—*Sydney Stock Journal.*

COLD STORAGE FOR EGGS.

There can be no doubt that eggs may be perfectly preserved by depositing them in a cool chamber for a considerable length of time. The latest proof of this comes from the *Sydney Stock Journal*, which states that an egg was opened at the Board for Exports' office last month. The egg was fourteen months old, as it was put in the cooling chamber at Pyrmont on 10th October, 1897, and it was as good as the day it was put in. We cooked a couple of eggs that had been in the cooling chambers for over three months, and they were for all the world like new-laid eggs—the milky appearance and all.

TO COMPARE THE READINGS OF DIFFERENT THERMOMETERS.

The Centigrade Thermometer is so often used instead of Fahrenheit's instrument in scientific work in the sugar-mill, in the dairy, &c., that it is convenient to know how to represent the degrees of one in terms of another. We lately noticed in a dairy the comparative degrees of Centigrade and Fahrenheit written on the wall of the coolroom for the guidance of the operators.

Now, here are a few simple formulæ embracing the three thermometers in general use which are based on the fact that 9 degrees Fah. = 5 Centigrade = 4 Réaumur.

TO REDUCE CENTIGRADE TO FAHRENHEIT.

$$\frac{\text{Centigrade degrees} \times 9}{5} + 32 = \text{Fahrenheit degrees.}$$

Example.

The freezing point of the Centigrade thermometer being 0, what is the corresponding degree of Fahrenheit's thermometer? By the above formula—

$$\frac{0 \times 9}{5} + 32 = 0 + 32 \text{ or } 32 \text{ degrees, the freezing point of Fahrenheit.}$$

What degree of Fahrenheit will correspond to 100 degrees Centigrade?

$$\frac{100 \times 9}{5} + 32 = 20 \times 9 + 32 = 180 + 32 = 212 \text{ degrees.}$$

Thus, 100 degrees C. and 212 degrees F. indicate the respective boiling points.

TO REDUCE FAHRENHEIT TO CENTIGRADE.

$$\frac{\text{Fahrenheit degrees} - 32 \times 5}{9} = \text{Centigrade degrees.}$$

Example.

The freezing point of Fahrenheit being 32 degrees, what is the corresponding degree of the Centigrade thermometer?

$$\frac{32 - 32 + 5}{9} = 0, \text{ the freezing point of Centigrade.}$$

TO REDUCE CENTIGRADE TO REAUMUR.

$$\frac{\text{Centigrade degrees} \times 4}{5} = \text{Réaumur degrees.}$$

EXAMPLE.

The boiling point of Centigrade being 100, what is the boiling point in Réaumur's thermometer?

$$\frac{100 \times 4}{5} = 20 \times 4 = 80 \text{ degrees, the boiling point of Réaumur.}$$

TO REDUCE FAHRENHEIT TO REAUMUR.

$$\frac{\text{Fahrenheit degrees} - 32 \times 4}{9} = \text{Réaumur degrees.}$$

EXAMPLE.

The boiling point of Fahrenheit being 212 degrees, what is the boiling point of Réaumur?

$$\frac{212 - 32 \times 4}{9} = 80 \text{ degrees the boiling point of Réaumur.}$$

TO REDUCE REAUMUR TO FAHRENHEIT.

$$\frac{\text{Réaumur degrees} \times 9}{4} + 32 = \text{Fahrenheit degrees.}$$

EXAMPLE.

The boiling point of Réaumur is 80 degrees. What is the boiling point of Fahrenheit?

$$\frac{80 \times 9}{4} + 32 = \frac{720}{4} + 32 = 212 \text{ degrees, the boiling point of Fahrenheit.}$$

TO REDUCE REAUMUR TO CENTIGRADE.

$$\frac{\text{Réaumur degrees} \times 5}{4} = \text{Centigrade degrees.}$$

EXAMPLE.

The freezing point of Réaumur is 0. What is the freezing point of Centigrade?

$$\frac{0 \times 5}{4} = 0, \text{ the freezing point of Centigrade.}$$

THE TOAD.

ITS VALUE TO THE HORTICULTURIST.

By A. J. BOYD.

In times past the common toad was looked upon with horror. It was said to be poisonous. But it sufficed amongst the ancients, and indeed it is at the present day amongst the ignorant sufficing proof of the deadly character of an animal, vertebrate or invertebrate, that it should be weird or ugly-looking. The toad is undoubtedly ugly, and the Surinam toad is particularly a disgusting and repulsive looking animal, yet it is perfectly harmless. The little bright-eyed Gecko—a flat-tailed lizard, which runs over the walls and ceilings of our houses, is equally harmless, and still is looked upon as an animal dangerous to touch. The vulgar impression is that strange-looking animals sting. Thus we hear of a snake or a lizard or a toad "stinging" the person who touches them. How easy would it be to dispel any such notions, if people could be induced to study a little elementary popular zoology and entomology. How many innocent and valuable animals, reptiles, and insects would be saved from a cruel and wanton slaughter, if their habits were only studied a little.

Concerning the toad, I find an excellent account of its life history and habits in Bulletin No. 46 of the Hatch Experiment Station of the Massachusetts Agricultural College (U.S.A.), by Mr. A. H. Kirkland, M.S., Assistant Entomologist to the Gypsy Moth Committee. This gentleman, whilst disclaiming any completeness of results of his study of the habits of the animal, has rendered a great service by demonstrating the great value of the toad as an insect destroyer. As to its poisonous properties, although he shows that the milky fluid secreted by the skin glands possesses acrid properties, as proved by the discomfort experienced by dogs and cats when they have bitten a toad, I know by experience that neither this secretion from the glands of the skin nor the posterior colourless discharge have any effect upon the human skin. I have often handled toads, bringing them into the bushhouse; and only a few days ago, whilst carrying one into the kitchen to co-operate in the destruction of cockroaches, my hand was covered with these fluids, but I experienced no sensation other than cold water would have produced. The toad neither bites, stings, nor ejects venom—*ergo*, it is as harmless as a house fly.

Now let us see what Mr. Kirkland has to say on the habits of the toad. As a rule, it is nocturnal, although it will sometimes venture out during the day when tempted by an abundance of food in its immediate vicinity, or, more commonly, when the air is full of moisture The toad does not take dead or motionless food. Only living and moving insects, centipedes, &c., are devoured. Cut worms or other larvæ, disturbed by the hopping of the batrachian, are safe so long as they remain curled up, but immediately they commence to travel they are captured. The toad's tongue, its only organ for seizing food, is soft extensile, attached in front, but free behind, and is covered with a glutinous substance which adheres firmly to the food seized. So rapid is the motion of this weapon, that a careful watch is necessary to see the animal feed.

That this is correct, the writer has had ample proof. Several insects, allowed to run loose near a toad, disappeared like magic, and it was almost impossible to observe how and at what moment they were seized. They were often taken before reaching the ground by this wily captor.

Mr. Kirkland attracted bees, wasps, ants, flies, and beetles to a piece of bread soaked in molasses. This was placed in a cage occupied by a toad, and "it was most interesting to watch the toad seize the flying insects, often before they had alighted on the bread."

It appeared that stinging insects such as bees, wasps, &c., caused some uncomfortable sensations in the toad after they were swallowed. Worms, too large to be swallowed at once, are forced into the captor's gullet by the use of the fore-limbs.

The toad is a gross feeder, and disposes of enormous quantities of food. In twenty-four hours the amount consumed by it equals four times the stomach capacity—that is to say, that in the time mentioned the stomach is filled and emptied four times. In his very careful investigations, Mr. Kirkland adopted two methods of establishing the economic status of the animal under observation:—First, observation of the feeding habits; second, stomach examination. Field examinations were important, but stomach examinations, as Professor Beal says, constitute "the final court of appeal." In the investigations on the food of the toad, stomachs were obtained from different parts of the State, and more particularly from different kinds of localities—*i.e.*, fields, gardens, marshes, plains, hills, woodlands, &c.—during every month of the toad's activity. In this manner 149 stomachs were collected and examined—a sufficient number to afford data for some general conclusions. In nearly every case the stomachs were examined while fresh, and a small number were preserved in formalin for a few weeks before examination.

In making the examinations the stomachs were split along the outer curvature, and the contents washed into a glass dish. The material thus obtained was separated into groups, and the insects or parts of insects and animals were identified by comparison with named specimens. The relation

per cent. by bulk of each class of food was then estimated, and the data as to character and amount were noted. The contents of the stomach of a toad—that is, the organic contents—are often mixed with inorganic substances, but this is merely a fortuitous circumstance, and is not due to any necessity for a supply of mineral matter for trituration purposes, as in the case of fowls and alligators. I have seen large quantities of stones, from 10 lb. weight downwards, taken from the stomach of a single alligator, but the toad requires no such violent aids to digestion. That process goes on with remarkable swiftness, as may be inferred from the quantities of food devoured in a single night by the latter animal. That food consists of beetles, worms, cockroaches, wasps, caterpillars, slugs, ants, &c.

A toad I lately caught in my bushhouse for examination appeared to have fed mainly on worms which occur there in great numbers. As to cockroaches, the toad will destroy them in large numbers, but I question whether its services are of much avail against the very large cockroaches which occur in some of our houses, for I placed one in a disused brick-oven in the kitchen which swarmed with cockroaches, some of very large size. The poor toad was gone next day; and as there was no possible outlet by which an animal of the toad's size could have got out, the inference was that the large cockroaches attacked, killed, and devoured it.

We have not space to give the whole of Mr. Kirkland's interesting paper on the subject. The lists he gives of insects and other animals found in the stomach of a single toad would seem to be marvellous, were it not conclusively proved how ravenous the reptile is, and how very rapidly the process of digestion proceeds. It will not be out of place to casually remark that the Gecko above-mentioned is also a pretty little reptile of the saurian or lizard order, which should be protected and cherished. During the late excessively hot weather, having found it often impossible to sleep, I have spent the night in writing. Lately a Gecko has taken up its abode in my room, and I noticed it very busy on my table catching quantities of the myriads of flying insects, particularly moths, which were attracted into the room by the light. All night long that little fellow has been at work, stalking a moth as a cat stalks a mouse. When within striking distance, with a sudden spring the Gecko caught its prey, swallowed it, and was ready for more. Geckos, when used to the presence of man, become perfectly fearless. This one ran over my paper in pursuit of insects, and even caught them on my hand. Another good hunter is the praying mantis. One of these was busy catching flies on the table. It was about three inches long, with wings over an inch and a-half in length. As it approached the edge of the table, the Gecko, who happened to be under the edge, suddenly caught it by the middle, and there was soon an end of the mantis. Toads and Geckos, besides several other ugly-looking but harmless animals, are the best friends of man, and should therefore be protected instead of being ignorantly destroyed.

THE USEFUL TOAD.

That the toad is beneficial to the farmer, and particularly to the gardener, is admitted by everyone who has observed its habits. Additional facts have been secured by recent observation at the Massachusetts Experiment Station, which show that 11 per cent. of the toad's food is composed of insects and spiders beneficial or indirectly helpful to man, and 80 per cent. of insects and other animals directly injurious to cultivated crops, or in other ways obnoxious to man. The toad feeds on worms, snails, sow bugs, common greenhouse pests, and the many legged worms which damage greenhouse and garden plots. It feeds to some extent on grasshoppers and crickets, and destroys large numbers of ants. It consumes a considerable number of May beetles, rose chafers, click beetles or adults of the wireworm, potato beetles, and cucumber beetles. It is a prime destroyer of cutworms and armyworms.

To all agriculturists the toad renders conspicuous service, but the gardeners and greenhouse owners may make this animal of especial value. Every gardener should aim to keep a colony of toads among his growing crops, and the practice of collecting and transferring them to the gardens is a commendable one. While the sense of locality is strong in the toad, and it will often return over considerable distances to its original haunts, yet it may be induced to remain in new quarters if there is a sufficient food supply. Many farmers provide toads with artificial shelters, made by digging shallow holes in the ground and partially covering them with a bit of board or flat stone. In such places toads will often remain for many days, sallying forth at night to seek food.

The enemies of the toad are hawks, owls, and, worst of all, small boys, who stone and kill many of them. Dr. C. F. Hodge states that he found 200 dead or wounded toads in a single day on the shore of a small pond on the grounds of Clark University. The loud cry of the toad at spawning time readily betrays its presence, and small boys, and sometimes those of a larger growth, gravitate towards the pools as naturally as do the toads themselves. There have been excellent laws enacted to protect insectivorous birds. Why should there not be as stringent legislation against the destruction of toads?—*Exchange.*

HOUSEHOLD HINTS.

USEFUL KNOWLEDGE FOR THE KITCHEN.

One teaspoonful equals 1 dram.

Two tablespoonfuls equal 1 oz.

One common-sized wineglassful equals ½ gill.

An ordinary size teacup holds 4 fluid oz., or 1 gill.

Ten common-sized eggs weigh 1 lb.

One tablespoonful soft butter weighs 1 oz.

One quart sifted flour, well heaped, weighs 1 lb.

One pint best-grade brown sugar weighs 13 oz.

Two level teacups granulated sugar weigh 1 lb.

Two tablespoonfuls of pulverised sugar, or flour, weigh 1 oz.

Two teacupfuls soft butter, well packed, weigh 1 lb.

One and one-third pints pulverised sugar weigh 1 lb.

One generous pint of liquid, or one pint of chopped meat, packed solidly, weighs 1 lb.

A common-sized tumbler holds about ½ pint.

CURING GOAT SKINS.

To cure a goat's skin, trim it on the flesh side with a sharp knife, and then well brush with a solution of 2½ lb. of alum and 1 lb. of common salt in 1 gallon of warm water; the skin should be treated two or three times with this solution on successive days. Now sprinkle bran all over the skin, brush out, and nail the skin to a board and dry it. As a preservative against insects, the flesh side may be treated with a mixture of arsenic and black prepared previous to drying.

TANNING SKINS.

THE *Farmer and Grazier* gives the following as a good recipe for tanning skins:—Each kind of skin requires some special treatment; that is, all skins cannot be tanned in the same manner. But the general principle is to trim off the useless parts of the skin and remove all fat from the inside, then soak

the skin in warm water for about an hour, then apply a coating of borax, saltpetre, and Glauber salts, 1 oz. of each dissolved in sufficient water to make a thin paste. The following day give a coating of a mixture of 1 oz. of sal soda, ½-oz. of borax, and 2 oz. of hard soap. This mixture should be slightly heated, without allowing it to boil. After this, fold the skin together and leave in a warm place for twenty-four hours. Then take 4 oz. of alum, 8 oz. of salt, and 2 oz. of saleratus; dissolve in hot water, and when cool soak the skin in it for twelve hours; wring out and hang up to dry. If the skin is not sufficiently soft after this, the soaking and drying have to be repeated two or three times.

EXPERIENCE WITH BI-SULPHIDE OF CARBON.

A correspondent of the *Journal of the Jamaica Agricultural Society* says:—I notice in your issue of July in answer to several letters you recommended carbon bi-sulphide for the destruction of weevils. I have had considerable experience with the carbon, and with your permission I will give it for the benefit of your many readers. The carbon is an explosive, and care should be taken not to light a match near it. The explosion is not so bad, but it will burn everything saturated with the gas. The evaporation of the carbon bi-sulphide is downward, as it is heavier than air. It is the only remedy in my judgment to kill ants. It will penetrate through 12 inches of dirt in a second. If you put a teaspoonful on the inner edge of a pot, say an 8-inch pot, it will kill all the ants in the pot and not injure the plant, provided you do not put it on the body of the plant. If you want to kill cutting ants, for a large bed it will take 1 gallon. Choose a time when the ants are in, then take a can and bend one side of it to form a spout, put an equal amount of carbon in each one of the holes or as near as you can. Then prepare yourself to jump. Strike a match and put it or throw it at one end of the outer holes and you will jump before you know it, and then you will think you have started an earthquake of your own, but there will be no damage except to the ants. When you jump, that is the last of the ants. I think the carbon bi-sulphide could be sold here for 2 dollars per gallon, or less by taking 5 gallons at a time.

BUDDING THE MANGO.

The *Journal of the Jamaica Agricultural Society* for October remarks:—"Budding the mango has been generally considered an impossibility, but this is a mistake, because it is done by experts in Florida, and it can be done by others when understood. The secret lies in taking the buds from about the middle of the growing shoot where they are well developed, and yet not too tender—where the colour of the bark is just turning from green to purple—and at a time just prior to a vigorous stage or growth in the tree to be budded. The shield method has been used, but the ring or plate style would be better."

THE PIG'S NOSE.

The nose of the pig is an index of its nature and condition. The shape and texture show that it is designed for nuzzling, for rooting, and for overturning things, and this is "the nature of the brute" to perfection. The condition of the animal is in many ways shown in the nose. In the healthy pig the nose is moist, cool, and pink in colour. To the touch it is elastic. In disease it changes in appearance, becoming pallid or purplish, dry, hot, and rigid, or else flabby. Many an experienced breeder can tell at a glance the general condition of a pig from the condition of its nose. When your swine grow listless, and do less nuzzling than usual, and seem to be dozing and sleeping more than usual, inspect their noses, and you are likely to find in them the indications of fever and other troubles.—*Farmer and Stockbreeder.*

STRYCHNINE SOLUTION FOR SEED CORN.

THE destruction wrought by bandicoots in newly sown cornfields, more particularly in scrub lands, has led to many devices either for the destruction of the pests or for the protection of the seed from their ravages. One of the peculiarities of the bandicoot is that, not contented with devouring the freshly planted grain, it will continue its depredations until the corn is 2 or 3 inches above the surface.

Steeping the grain in tar has hitherto been about the only protective method adopted by farmers.

It has been now stated that a solution of strychnine will be found an effective preventive by destroying the depredators at once, when they attack the grain. But few people understand the way in which to prepare a solution. Hence these few notes on the subjects may be of value to any farmers who are troubled by the bandicoots.

Solution of strychnine may be made as follows:—

One part of strychnine is dissolved by 8,333 parts of cold water.

Another authority says:—

One part of strychnine is dissolved by 6,667 parts of cold water.
One part of strychnine is dissolved by 2,500 parts of boiling water.

As, however, these statements do not convey to the ordinary lay mind any idea of the quantity of strychnine which is represented by 1 in 8,333, it will be better understood if we say that—

One gallon of cold water will hold 10 grains of strychnine in solution; and
One gallon of boiling water will hold 30 grains of strychnine in solution.

ALCOHOL SOLUTIONS.

One hundred and twenty parts cold alcohol will dissolve 1 part of strychnine. Ten parts boiling alcohol will dissolve 1 part of strychnine.

Methylated spirit will do as well as alcohol.

Alcohol 58 o.p. has the dissolving strength of ordinary spirits of wine.

Eighty-six per cent. of proof spirit will absorb 1 part of strychnine to 140 of spirit. This is equal to 41·8 per cent. of absolute alcohol.

OTHER SOLVENTS.

The best are:—Chloroform, which dissolves 1 part of strychnine in 6 parts of chloroform; and benzole, which dissolves 1 part strychnine in 164 parts of benzole.

Ether dissolves 1 part strychnine in 1,250 parts ether.

Carbon bi-sulphide dissolves 1 part strychnine in 485 parts carbon bi-sulphide.

Glycerine dissolves 1 part strychnine in 300 parts glycerine.

Taking for granted that the seed corn will absorb all the solution, if we know the number of grains in a bushel and the quantity of the solution, we can arrive at the quantity of strychnine deposited on each grain.

Thus:—A bushel of corn contains on an average 50,000 grains.

If a gallon of strychnine solution contains 30 grains of the poison, and all is absorbed, then each grain would hold 31 m. grammes of strychnine.

If all the solution is not absorbed, then the remainder must be deducted from the 30 grains.

ACTION OF STRYCHNINE SOLUTION.

In this connection it is interesting to learn the absolute killing strength of a strychnine solution.

Chemists reckon its action in terms of milligrammes per kilo. of the weight of the animal to be destroyed.

To kill a rabbit: By a course of over twenty experiments it is conclusively shown that 6 mil. grs. per kilo. (2·2 lb.) is the destructive dose.

For cats: ·75 (or $\frac{3}{4}$) m. gramme per kilo.

For swine: $\frac{1}{3}$ grain (injected).

For fowls: 50 m. grammes (given internally).

For frogs: 2 m. grammes per kilo. (injected).

In this case, as no frog weighs a kilo., a calculation is required. Say twenty frogs weigh 1 kilo., then $\frac{1}{10}$ m. gramme is the dose to be injected to cause death.

For mice and rats: 2·3 to 2·4 m. grammes per kilo. (given internally).

For snakes: 23·1 milligrammes per kilo. (injected).

For a horse: 10 grains (given internally).

For a human being: $\frac{7}{10}$ grain, or 38 m. grammes (injected subcutaneously), will kill an ordinary man weighing 150 lb.

Taking the weight of a bandicoot at 2 lb., and the amount of strychnine on a grain of corn 31 m. gramme (1 grain = 54 m. grammes), then it will be seen that out of the 30 grains, or 1,620 m. grammes, far more than sufficient poison lies on each grain to kill any adventurous bandicoot which may conduct foraging operations on the newly sown field.

TOBACCO SOILS.

In our article on tobacco-growing in the January number of the *Journal*, one statement as to a good tobacco soil is liable, as Mr. Nevill points out, to be misunderstood. He says that "bright" tobaccos are grown in Virginia on the thin sandy soils. The "heavy" tobaccos, on the other hand, are grown on good soils, yet not on such as produce a rich, rank vegetable growth. Thus, our wheat lands would be utilised for heavy tobaccos, the more sandy soils for bright tobaccos, whilst the deep, rich, alluvial tropical scrub soils would not be so suitable for the crop until their wonderful richness has been to some extent modified by repeated crops of, say, sugar-cane, maize, &c.

POTASH, PHOSPHATE, AND NITRATE.

In reply to "Cocky," Childers:—Nitrate of soda in $2\frac{1}{2}$-cwt. sacks, superphosphate in 2-cwt. sacks, and kainit (potash) are procurable in Brisbane at the following prices:—

	s.	d.	
Nitrate of soda	12	6	per sack
Superphosphate	4	6	,,
Kainit	4	0	,,

All information on the subject of the cost of these and other fertilisers may be obtained by communicating with Messrs. Webster and Co., Mary street, Brisbane.

WHAT TO DO WITH THE EARLY MAIZE.

The serious losses in the early maize crop which have been entailed on farmers lately by the continued absence of rain might, to a large extent, be obviated if they would follow the advice so frequently given in this *Journal*, and indeed in all other agricultural journals—to turn the whole crop into ensilage. Hundreds and thousands of acres of fine green maize, which would never produce sufficient cobs to make it worth harvesting, have been allowed to go to waste. By-and-by we shall see the miserable spectacle of vast masses of what is just now splendid cattle feed put in heaps, and burnt off to get rid of it. Time and again have the farmers been warned to provide against possible droughts, by building ensilage stacks, or by the erection of silo buildings, but mostly the advice is disregarded, and when the evil time comes their stock are starved, many die, and solid cash has to be expended for the purpose of buying feed both for dairy cattle, pigs, and farm horses.

The building of an ensilage stack requires no expert. Any good farm hand can do it. Of course a stack is not equal to a building, but the building costs money, whilst the stack merely costs labour—which is also money to be sure—but not in the same form or proportion. Supposing that a couple of

feet all round the stack are waste—that is a small matter when compared with the immense bulk of fodder of the most nutritious and most milk-producing character which the farmer has secured.

Notwithstanding all that is written on high-class farming and the anxiety of farmers to cultivate their land in the best possible manner at the least possible expense, there is an unconquerable spirit of conservatism in the true hereditary farmer which, in the generality of cases, will not allow him to work on principles of which he confesses that he sees the advantage. What was good for his forbears is good for him, he says, quite forgetting that others are profiting by labour-saving implements, cheap but effective manures, improved classes of cattle, swine, and poultry, and hence are enabled to put their produce on the market at far less expense than the man who looks on at what he calls these "fads," and works on in the old groove.

To become successful in farming at the present day, the farmer must march with the times, or he must go to the wall, and he in most cases has himself to blame. Science points out to him the means of defying the effects of drought—it has shown him how to revolutionise the work of the dairy; how to send delicate produce on long sea voyages without detriment: it has given him new products, new fertilisers, new labour-saving utensils—still, look round our farming districts, and what do we see? Except in the wheat-growing districts, we see the same style of farming as obtained in the colony thirty years ago. Not even the flail has gone completely out of use. Take drainage again. Every farmer knows the value of drainage. How many put it in practice? Only lately a farm could be seen not a hundred miles from Brisbane, which had, amongst the rest, received the benefit of the late rains. Over half the area, which is nearly all under maize crop, was covered with an inch or two of water. On one part, however, the land is slightly raised. Here the maize is quite a foot and often two feet higher than that on the low ground. Yet that farmer says he cannot afford to drain. But he can afford to plough and cross-plough, harrow, and roll, put in a crop, and, without harvesting a grain of corn or a single potato, plough all out again, resow, and repeat the performance *ad lib.*, living meanwhile on the produce of a few unhappy cows, which pick up their living in the best way they can.

The same style prevails in the paddocking of the farm stock. Instead of paddocks being subdivided and fed down in rotation, a fence is put round the whole paddock—all the beasts are turned into it. The grass is being fed down night and day. It is never afforded a chance to grow, and the result is, naturally, a bare 60-acre or 100-acre paddock in which the stock are fain to paw out the roots of the grass to obtain any sort of sustenance in dry weather. If such paddocks were subdivided, and the stock changed from one to the other, there would be feed all the year round, and stock would be kept in good condition.

KEEPING ONIONS.

THE principal difficulty in storing onions is their liability to sprout. This must, if possible, be avoided, because, whenever growth is set up in any bulb or seed, that bulb or seed deteriorates in proportion to the extent of growth. Anyone who has tried to eat an old seed potato, which has been inadvertently gathered up with the new crop, will be aware of this fact. Onions, when pulled, should not be stored away at once, but should be left for a few hours on the ground to dry. Then they should be put away dry, and in the coolest shed or barn which is available. They require constant looking over to sort out any bad ones, for, as in the case of fruit—such as oranges, apples, pears, &c.—a single rotting onion will infect all those in its immediate neighbourhood. It used to be the custom in the good old-fashionod farmhouses in the old country to hang the onions in strings to the great kitchen rafters in company with hams, flitches of bacon, &c. This hanging in strings is a good plan where it is only a question of keeping a few, but in the case of many tons the labour would not be recompensed by the profit.

WORKING HORSES.

Much unintentional cruelty is practised by those in charge of working horses during such extremely hot weather as has lately been experienced in this colony. This is especially so in the case of plough horses. The animals are brought up at half-past 5 or 6 in the morning. They may have had a drink at the waterhole or trough, or they may not, for all the ploughman knows. They are given a feed of dry lucerne hay with or without any corn—probably without, corn being at so high a price. Then they are yoked up and worked throughout the whole morning up to midday without being allowed either spell or drink, for quite four hours. The ploughman has frequent occasion to quench his thirst from his waterbag, yet he never thinks that his cattle are equally thirsty. With a refinement of cruelty, this waterbag may sometimes be seen hung to one of the hames, and the unhappy horse that carries it is tantalised by the smell and gurgling of the water of which not a drop reaches his lips.

Horses require water at frequent intervals. To let an animal drink its fill at 7 a.m. and then work till noon without any refreshment is cruelty. If men would but pause, and think of the effect of a drink on themselves, perhaps they would have more consideration for the patient horses. He feels thirsty after working for an hour, and he quenches his thirst by a good drink from the bag. Now, as he gets to work again, the violent exercise causes him to perspire freely, and it is not long before the loss by perspiration requires replenishing. Then he again has recourse to a "quencher." Why, in the name of humanity, can he not consider that the same causes produce the same effects on the horses? There would be very little time lost if they were allowed a drink every two hours. They would work the better for it, and be less liable to internal disorders from overloading their stomachs with fluid at long intervals. It cannot be too strongly impressed upon all men in charge of horses that the animals like to drink little, but often.

TREATMENT OF DAIRY COWS.

It is not given to any but those who thoroughly understand the nature of the dairy cow to know how much actual cash loss those sustain who knock about their cows, screw their tails, set dogs on to them to frighten them into submission, and utter fiendish yells to make them "bail up." Here is an experiment made by a dairyman in America and its result:—

IMPORTANCE OF GENTLE TREATMENT OF DAIRY COWS.

That dairy cows should receive gentle treatment is a fact that is well known to all who have any dealings with these, but the extent of the injury done by rough treatment is perhaps not fully known. The following experiment—certainly a novel one, which has its origin in America—shows very well the loss rough treatment may and does cause:—"He let the dogs into the yard with the cows, and then two men entered with sticks, shouting, causing the dogs to bark, and making pandemonium reign for a few minutes. The herd was then brought into the bails and milked, with the result that the yield of milk was very much less, and the test of butter fat showed a loss of 40 per cent. as compared with the week previous. Supposing this herd gave 300 lb. at a milking of 5 per cent. milk when treated kindly, the loss in weight, placed at a low figure, must have been in this case at least 5 per cent. of 15 lb., while the loss in butter fat of 40 per cent. would bring the test down to 3 per cent. At 20 cents per lb., the 300 lb. of milk, testing 5 per cent., would be worth 3 dollars, but after this racket with the dogs the net value would be only 1·74 dollars, or a loss of 1·26 dollars (about 5s. 3d.) From this it will be seen how sensitive a creature the cow is, and how easily she may be influenced in the quality and quantity of her milk. Though the above is an extreme case, there is a valuable lesson in it for every dairyman."

DEHORNING CATTLE.

The following is from an official bulletin issued from the Maine Experiment Station:—

Dehorning is to be recommended because dehorned cattle are more easily cared for than those with horns. The best time to perform the operation is during cold weather, when there will be no trouble from flies. To dehorn mature animals, use clippers that will remove the horn perfectly at a single stroke and in a moment of time. With suitable clippers, properly used, the operation is simple and very quickly performed. Animals do not give evidence of great suffering as an effect of dehorning. The tissues injured in dehorning are not very well supplied with nerves, and they are quickly cut through. Good evidence that dehorning is not very painful is the fact that cattle will resume feeding immediately after being operated on, and the yield of milk in cows is not perceptibly affected. Compared with castration of colts and calves, dehorning may be considered painless. Those who are familiar with the operation and the results of it are its most enthusiastic advocates.

To prevent the growth of horns, calves under three weeks of age can have the embryo horns removed with one stroke of a sharp knife, or they can be treated with caustic sufficiently powerful to destroy them. In the past, efforts have frequently been made to prevent the practice of dehorning on the ground that it caused needless pain. It would seem to us that efforts can now better be expended by endeavouring to have the last relic of a horn removed from our domestic cattle, who ceased to need them when they came under the protection of man. Horns may sometimes be ornamental, but it is evident that they are usually useless, expensive, and dangerous luxuries.

DEAD WEIGHT OF PIGS.

The following table, showing the age, live weight, and dead weight and loss in pounds and tenths per 20 lb. of live weight, will doubtless be of interest and value to our readers:—

	Age.		Live Weight.	Saleable Dead Weight.	Loss in lb. per 20 lb. Live Weight.
	Months.	Days.	Lb.	Lb.	Lb.
Hog	6	11	135	109	3·85
Boar	7	12	155	123	4·13
Hog	7	12	167	134	3·95
Gilt	10	11	278	242	2·59

The table, which is given by a correspondent of the *Farmer and Stockbreeder*, gives particulars of very heavy animals. For instance, one sow (age not given) weighed 643 lb., her saleable dead weight was 570 lb., and the loss per 20 lb. live weight 2·27 lb. In Queensland such enormous pigs are not marketable, the usual weight acceptable by the bacon factory proprietors being from 90 lb. to 150 lb.

By the above table, a pig weighing 140 lb. would lose about 28 lb., giving 112 lb. of saleable meat.

A NOVEL POULTRY CLUB.

There has recently been formed in London a club called "The Utility Poultry Club," for the laudable purpose of keeping up and improving the utility characteristics of poultry. One can wish them every success without accepting their dictum that "there is no doubt that purebred birds, when bred for the purpose, are the most profitable of any, producing eggs and meat, and also being the foundation of the profitable first cross." What is a pure breed? But the club does not insist on this point, for the first of the eight objects of the club is "to encourage the breeding of pure or cross bred birds, with due

regard to utility, by breeding only from selected layers." The club intend to give special prizes at shows for the best system of packing and marketing poultry produce; for table poultry and for eggs; and they are now holding a laying competition. The birds are all entrusted into the hands of a manager, who, of course, does not compete; have all the same sized house and same sized run, and are treated under exactly the same conditions. The period for the competition is sixteen weeks, and they have now been competing—I trust with the energy of fighting cocks—for about four weeks. A pen consists of four birds only, hatched in this year, and in each house are eight birds, four layers of brown eggs and four of white, so that no confusion can arise to whom to credit the eggs. The cost of food and management is deducted from the money obtained from the eggs, and any balance is returned to the competitor, who pays an entrance fee of 10s. Of course, the difficulty in all such competitions is the danger of fraud creeping in, but the rules seem carefully drawn to prevent this, and there is not the smallest reason to doubt that the competition will be conducted with absolute impartiality. The idea is novel, and a change from the stereotyped poultry show and its artificial standard of excellence.

EGGS.

Eggs, as all housekeepers know, are sold by the dozen. Has it never struck the dealers in eggs, grocers, housewives, and other egg-buyers that this is a most absurd method of buying? Of course it is an advantage to the egg-producer, for, as eggs are eggs, he or she mixes large and small together and obtains the same price, whether they are not much larger than pullets' eggs or are all double-yolked. Supposing potatoes and onions were sold by the dozen and irrespective of size, we should find that the purchasers would very soon only give half the money for the smaller tubers, or they would not purchase at all. As it is, onions and potatoes are paid for according to size, a mixture of small and large entailing a loss to the seller. Apples, pears, peaches, oranges, &c., are all carefully graded. Why not grade eggs and pay a less price for the smaller ones? Or let them be sold by the pound. As it is, a housekeeper by taking eggs of different sizes suffers considerable loss; indeed, she is the only sufferer, for the farmer and storekeeper can always unload. If some such plan were adopted whereby the smaller eggs should bring the smaller price, we should in a short time find our farmers' wives getting rid of the layers of small eggs and only keeping those which laid the largest.

DESTRUCTION OF NOXIOUS WEEDS.

Experiments innumerable have been made in the old country with a view to the complete extermination of charlock in wheat fields, all having more or less success. At last, after a careful series of experiments, Dr. W. Somerville has found that, by applying a solution of iron or copper sulphate by means of a suitable spraying machine at a time when the charlock plants are 1 or 2 inches high, the weeds are at once killed. The best results were obtained by a 7½ per cent. solution of iron sulphate applied at the rate of about 40 gallons per acre, the cost being (exclusive of the outlay for a spraying machine) a little over 1s. per acre. "The reason why charlock is destroyed by the solution while corn escapes," writes Dr. Somerville, "is this: The latter has a smooth upright leaf, on which the liquid cannot rest, whereas the leaves of charlock are rough and broad, and lie more or less horizontally. The consequence is that the latter catch and retain the poison, which has thus the opportunity to be absorbed and to bring about the death of the plant. The result is the same on all rough-leaved plants, and thus it is that such weeds as thistles are also blackened and crippled by the spray." With the object of bringing this method to the notice of farmers who have infested ground, the agricultural

department of the Newcastle-on-Tyne College of Science is proposing to demonstrate its efficacy by undertaking to spray a few hundred acres of land in some of the northern counties. The college proposes to supply the spraying machine, the material, and a superintendent to direct operations, while those taking advantage of the offer will be expected to supply three workers and two horses during the progress of the work, and also to contribute a small charge per acre towards the expenses of the undertaking. In order to show the effect of the spray on each area dealt with, half-an-acre will be left untreated in each field.

With our Noogoora burr, thistles, Bathurst burr, and other vegetable pests, this remedy might be worthy of a trial. There are plenty of spraying machines available, and the cost would not appear to be such as should deter anyone from making a trial on a small scale.

JOHNSON GRASS.

WE have been asked on two or three occasions to give a recipe for the destruction of "that detestable weed," Johnson grass. On the other hand, we have been requested to inform a correspondent where he can obtain sufficient seed of "this excellent fodder grass" to plant 100 acres. This contrary testimony gives rise to the question:—"Is Johnson grass a good fodder plant or not?"

The answer would appear to be:—In certain localities, with a certain class of soil, and with certain conditions of climate, it may develop excellent qualities, but the general consensus of opinion is against it. Doubtless if it could be grown on some of the desert plains of the West, it would be found that camels would thrive on it, and possibly also stock of other descriptions; but judging by results in the farming districts we should strongly urge its eradication, especially as there are so many other really excellent fodder plants which are greatly relished by stock.

The *Australasian* has the following conflicting statements concerning this friendless grass:—

Amongst the warm advocates of the plant is Mr. W. O'Neill, of Narramine, who cannot understand why there are so many who advocate a discontinuance of its cultivation. His experience has been that the grass is a very fine fodder as well as an immense producer, and when asked if it is not a fact that neither cattle, sheep, nor horses will eat it if allowed to attain to a height of 6 inches to 12 inches, owing to the large amount of harsh fibre present in the stem and flag, he remarks that this has by no means been his experience, as his stock eat it well when old as well as when young, and in a dry state as hay with as much avidity as while growing. This statement was certainly a surprise to the one to whom it was made, in view of the experience of numerous Victorian growers, who have found that the grass was rejected even by hungry bullocks, and of a well-known grazier, who says that the growing plants are refused by stock if not kept closely fed down. There may be something in the soil—salt or lime or some other element—that reduces the harshness of the Johnson grass, or imparts to it a sweetness unknown in either Riverina or Victoria. If this be so, it accounts for the favour the crop has found in the Narramine district. Its virtue as a heavy yielder cannot be denied; its capability in resisting dry weather is admitted; and its freshness of appearance even in the heat of summer is such as to make it very attractive to those in search of green fodder when other plants are dry. If it be that the Narramine farmer referred to has discovered in Johnson grass the hitherto unknown virtue of palatableness, and can show that this qualification can be imparted to the plant by fertilising with lime or salt, or whatever other element may be necessary, then it must be said that he has made a valuable discovery indeed.

BRITISH IMPORTS OF DAIRY PRODUCE.

In the year 1897 there were landed on Great Britain and Ireland shores 360,000,000 lb. of butter, the value of which was just £16,000,000 sterling; so that Britishers at home consume, in round figures, 1,000,000 lb. of foreign butter each day in the year. The imports of cheese for the twelve months amounted to nearly 300,000,000 lb., for which close on £6,000,000 sterling were paid. Milk and cream were naturally less important in quantity; still, other countries sent some 84,000,000 pints of both, and received £1,500,000 sterling in exchange.

But the imports of eggs, which have increased rapidly each year, reached in 1897 the enormous quantity of 1,684,000,000. The value of these is returned at £4,356,799, and a simple calculation will show that the daily home consumption reaches the respectable total of 4,613,178 foreign eggs. They annually pay the foreigner over £1,250,000 sterling for poultry and game, £4,500,000 for fruit, and £3,500,000 for vegetables; while the lard and margarine imported into these islands last year weighed 300,000,000 lb., and cost exactly £4,478,513.

THE WORLD'S SUPPLIES OF BEEF AND MUTTON.

An exchange says:—In the State of Texas (U.S.A.) there are enough cattle and sheep to supply the whole world with beef and wool. Although the population is only 3,500,000, its area is very large, and about 3,500,000 head of cattle and 3,000,000 sheep can be counted. It has about 8,000,000 dollars' worth of rolling-stock, and spends 4,000,000 dollars on its schools. The railroads cover 10,000 miles.

The population of Queensland is only 450,000. The colony has an area of 700,000 square miles nearly. On its vast plains can be counted 6,089,013 head of cattle, 17,797,883 sheep, 479,280 head of horses, 110,855 pigs.

The railways of the colony cover only 2,430 miles, yet the revenue derived from them is £1,158,657 per annum; £247,472 were expended on schools and education in 1897-1898, which comparatively is far more than is expended in Texas.

If Queensland had a population of 3,500,000 she would be able to supply several worlds: 59,561,352,225 gallons flow annually from her 379 artesian bores, watering millions of acres of dry country on which are depastured countless sheep. It will thus be seen that Queensland is a powerful factor to be reckoned with in the matter of supplying the world with not only beef and mutton, but with sugar (which alone amounted to 150,000 tons in 1897-98) and a variety of fruits, fibres, timber, &c., which only now are being fairly exploited by capitalists.

AGRICULTURAL AND HORTICULTURAL SHOWS.

The Editor will be glad if the secretaries of Agricultural and other Societies will, as early as possible after the fixture of their respective shows, notify him of the date, and also of any change in date which may have been decided on.

LIST OF AGRICULTURAL, HORTICULTURAL, AND PASTORAL SOCIETIES AND ASSOCIATIONS IN QUEENSLAND.

Postal Address.	Name of Society.	Name of Secretary.	Date of Show.
Allora ...	Central Downs Agricultural and Horticultural Association	J. H. Buxton... ...	1 Feb. 1899
Beaudesert ...	Logan and Albert Pastoral and Agricultural Society	M. Hinchcliffe ...	6 May
Beenleigh ...	Agricultural and Pastoral Society of Southern Queensland	Wilson Holliday ...	30 Sept.
Birthamba ...	South Kolan Agricultural and General Progress Association	G. W. Nixon ...	
Blackall ...	Barcoo Pastoral Society	F. Clewett	
Boonah ...	Fassifern and Dugandan Agricultural and Pastoral Association	J. A. McBean ...	28 April
Booyal Scrub	Booyal Progress Association	H. Masson	
Bowen ...	Pastoral, Agricultural, and Mining Society ...	J. E. Smith	8 June
Bowen ...	Preston Farmers' Association	R. A. Foulger ...	
Bowen ...	Proserpine Farmers' and Settlers' Association	G. W. Pott	
Brisbane ...	Horticultural Society of Queensland	G. K. Seabrook ...	21 and 22 April and 10 Oct.
Brisbane ...	Moreton Agricultural, Horticultural, and Industrial Association	J. Duffield	
Brisbane ...	Queensland Acclimatisation Society	E. Grimley	
Brisbane ...	Queensland Fruit and Economic Plant Growers' Association	G. K. Seabrook ...	
Brisbane ...	National Agricultural and Industrial Association of Queensland	H. C. Wood	10, 11, and 12 Aug.
Brisbane ...	Queensland Stockbreeders' and Graziers' Association	F. A. Blackman ..	
Brisbane ...	United Pastoralists' Association	Fredk. Ranson ..	
Bundaberg ...	Bundaberg Agricultural and Pastoral Society	A. McIntosh... ..	12, 13, and 14 Oct.
Bundaberg ...	Bundaberg Horticultural and Industrial Society	H. E. Ashley... ...	
Bundaberg ...	Woongarra Canegrowers' and Farmers' Association	H. Cattermull ...	
Burpengary...	Burpengary Farmers' Association	C. H. Ham	
Caboolture ...	Caboolture Farmers' Association	G. Mallet	
Cairns ..	Barron Valley Farmers' and Progress Association	W. F. Logan... ...	
Cairns ...	Cairns Agricultural, Pastoral, and Mining Association	A. J. Draper	28 and 29 Sept.
Cairns ...	Hambledon Planters' Association	E. Whitehouse ...	
Charleville ..	Centra Warrego Pastoral and Agricultural Association	A. J. Carter	25 and 26 May
Charters Towers	Towers Pastoral, Agricultural, and Mining Association	W. Tilley	
Childers ...	Isis Agricultural Association	H. Epps	
Childers ...	Childers Progress Branch, Isis Agricultural Association	N. Rosenlund ...	
Childers ...	Doolbi Mill Branch, Isis Agricultural Association	W. T. H. Job ...	
Childers ...	Childers Mill Branch, Isis Agricultural Association	H. Epps	
Clermont ...	Peak Downs Pastoral, Horticultural, and Agricultural Society	F. Leysley	
Clermont ...	Peak Downs Dairymen and Settlers' Association	A. G. Pursell ...	
Cooktown ...	Cook District Pastoral and Agricultural Society	W. R. Humphreys ...	
Cordalba ...	Cordalba Farmers' Association	B. Goodliffe	
Currajong ...	Currajong Farmers' Progress Association ...	Wm. Howard ...	
Cunnamulla	South Warrego Pastoral Association	J. Winward	
Degilbo ...	Degilbo Farmers' Progress Association ...	F. A. Griffiths ...	
Gayndah ...	Gayndah Agricultural and Horticultural Association	J. C. Kerr	

AGRICULTURAL AND HORTICULTURAL SOCIETIES—*continued.*

Postal Address.	Name of Society.	Name of Secretary.	Date of Show.
Gin Gin ...	Pastoral and Agricultural Society of Gin Gin	E. K. Wollen ...	
Gladstone ...	Gladstone Pastoral and Agricultural Association	W. J. Manning ...	
Gooburrum, Bundaberg	Gooburrum Farmers' and Canegrowers' Association	W. J. Tutin	
Goondiwindi	MacIntyre River Pastoral and Agricultural Society	A. Gough	
Gympie ...	Agricultural, Mining, and Pastoral Society	F. Vaughan	14 and 15 Sept.
Gympie ...	Gympie Horticultural Society	W. G. Ambrose ...	
Helidon ...	Helidon Scrub Farmers' Progress Association	M. Morgan	
Herbert River	Halifax Planters' Club	H. G. Faithful ...	
Herbert River	Macnade Farmers' Association...	E. C. Biggs	
Herbert River	Ripple Creek Farmers' Association	J. W. Grimes ...	
Herberton ...	Mining, Pastoral, and Agricultural Association	John M. Hollway ...	11 and 12 April
Hughenden ...	Hughenden Pastoral and Agricultural Association	W. H. Mulligan ...	10 and 11 May
Ingham ...	Herbert River Farmers' Association	...	
Ingham ...	Herbert River Pastoral and Agricultural Association	P. S. Cochrane ...	3 Sept.
Ipswich ...	Ipswich and West Moreton Agricultural and Horticultural Society	P. W. Cameron ...	6 Oct.
Ipswich ...	Queensland Pastoral and Agricultural Society	Elias Harding ...	1 and 2 June
Kalkie (Bundaberg) ...	Woongarra Canegrowers' and Farmers' Association	O. H. A. Kraak ...	
Kandanga (near Gympie)	Kandanga Farmers' Association	N. Rasmussen ...	
Kolan ...	Kolan Canegrowers' and Farmers' Association	C. Marks	
Laidley ...	Lockyer Agricultural and Industrial Society	John Fielding ...	27 and 28 July
Loganholme...	Logan Farming and Industrial Association ...	F. W. Peek	
Longreach ...	Longreach Pastoral and Agricultural Society	J. P. Peterson ...	12 April
Lucinda Point	Victoria Farmers' Association	W. S. C. Warren ...	
Mackay ..	Agricultural, Pastoral, and Mining Association	F. Black	
Mackay ...	Pioneer River Farmers' Association	E. Swayne	
Maryborough	Maryborough Horticultural Society	H. A. Jones	
Maryborough	Wide Bay and Burnett Pastoral and Agricultural Society	G. Willey	27, 28, and 29 July
Milbong ...	Milbong Farmers' Association	T. R. Garrick ...	
Mitchell ...	Mitchell and Maranoa Pastoral, Agricultural, and Vinegrowers' Association	H. J. Corbett ...	
Mosman River	Mosman River Farmers' Association	...	
Mount Mee...	Mount Mee Farmers' Association	R. Thomas	
Mount Morgan	Mount Morgan Mining, Agricultural, Poultry, Pastoral, and Horticultural Society	G. Orford	
Mulgrave ...	Mulgrave River Farmers' Association ...	Thos. Swan	
Nerang ...	South Queensland and Border Pastoral and Agricultural Society	W. J. Browne ...	
North Isis ...	North Isis Canegrowers' Association	W. J. Young ...	
Pialba ...	Pialba Farmers' Association	J. B. Stephens ...	
Pinbarren ...	Pinbarren Agricultural and Progress Association	H. Armitage, senr. ...	
Rockhampton	Central Queensland Farmers' and Selectors' Association	T. Whitely, Coowonga	
Rockhampton	Central Queensland Pastoral Employers' Association	G. Mackay	

AGRICULTURAL AND HORTICULTURAL SOCIETIES—*continued.*

Postal Address.	Name of Society.	Name of Secretary.	Date of Show.
Rockhampton	Central Queensland Stockowners' Association	R. R. Dawbarn ...	
Rockhampton	Rockhampton Agricultural Society	R. R. Dawbarn ...	10 and 11 May
Roma ...	Western Queensland Pastoral and Agricultural Association	H. K. Alford ...	10 and 11 May
Roma ...	Yingerbay Farmers' Association	F. E. Glazier... ...	
Rosewood ...	Farmers' Club	P. H. Adams... ...	25 Aug.
Springsure ...	Queensland Pastoral Society	G. R. Milliken ...	
Stanthorpe ...	Border Agricultural, Pastoral, and Mining Society	Geo. Simcocks ...	
Stanthorpe ...	Stanthorpe Horticultural and Viticultural Society	R. Hoggan	
St. George ...	Balonne Pastoral and Agricultural Association	T. M. Cummings ...	
Toowoomba	Darling Downs Horticultural Association ...	H. Hopkins	
Toowoomba	Drayton and Toowoomba Agricultural and Horticultural Society	H. Symes	
Toowoomba	Royal Agricultural Society of Queensland ...	F. Burtt	2, 3, and 4 Aug.
Townsville ...	Townsville Pastoral, Agricultural, and Industrial Association (formerly North Queensland Pastoral and Agricultural Association)	J. N. Parkes	
Wallumbilla	Wallumbilla Farmers' Association	P. W. Howse ...	
Warwick ...	Eastern Downs Horticultural and Agricultural Association	J. Selke	25 and 26 Jan., 1899
Wellington Point	Wellington Point Agricultural, Horticultural, and Industrial Association	J. B. Blaine	6 Aug.
Woombye ...	Woombye Fruitgrowers' Association	P. S. Hungerford ...	
Woowoonga	Woowoonga Scrub Farmers' Association ...	H. B. Griffiths ...	

The Markets.

AVERAGE PRICES FOR DECEMBER.

Article.		DECEMBER. Top Prices.
		£ s. d.
Bacon	lb.	0 0 7
Bran	ton	5 11 10½
Butter, First	lb.	0 0 11
Butter, Second	„	0 0 $7\frac{5}{16}$
Chaff, Mixed	ton	3 15 0
Chaff, Oaten	„	4 5 0
Chaff, Lucerne	„	3 13 9
Chaff, Wheaten	„	3 0 0
Cheese	lb.	0 0 $9\frac{5}{16}$
Flour	ton	9 16 3
Hay, Oaten	„	3 16 4½
Hay, Lucerne	„	2 14 4½
Honey	lb.	0 0 2
Japan Rice, Bond	ton	16 10 0
Maize	bush.	0 4 6⅛
Oats	„	0 3 6
Pollard	ton	6 1 3
Potatoes	„	12 17 6
Potatoes, Sweet	„	3 15 0
Pumpkins	„	5 7 6
Sugar, White	„	14 10 0
Sugar, Yellow	„	11 12 6
Sugar, Ration	„	9 10 0
Wheat	bush.	0 3 6
Onions	cwt.	0 7 7½
Hams	lb.	0 0 $9\frac{7}{16}$
Eggs	doz.	0 1 1⅛
Fowls	pair	0 5 11¼
Geese	„	0 7 0
Ducks, English	„	0 3 7¾
Ducks, Muscovy	„	0 5 6
Turkeys, Hens	„	0 7 10½
Turkeys, Gobblers	„	1 1 9

Orchard Notes for February.

BY ALBERT H. BENSON.

DURING this month there is no great output of Queensland-grown fruit, though there will still be a few pines and mangoes to market on the coast and grapes from the Downs and Roma districts also, as well as European plums, pears, apples, quinces, peaches, &c., from the Downs, especially the Stanthorpe district. Growers should take every care to send nothing to market unless it is sound, as diseased fruit is unsaleable, and its presence prevents the sale of sound local fruit. Large plums, such as the Yellow Magnum Bonum and Pond's Seedling, which do well in the colder districts, will pay for extra care in handling and packing, and the same applies to good peaches or pears. The plums should be carefully packed in shallow boxes, but the peaches should be wrapped in tissue-paper and packed in single layers in trays fitting into well-ventilated crates, so that they can reach the market with the bloom on and without being bruised. For sound fruit in this condition there is a good sale, and it will pay growers to put such fruit on the market in the best manner possible. Chip baskets holding about 5 lb., and fitting into crates, are also excellent for marketing high-class plums or firm-fleshed peaches, but soft-fleshed peaches that bruise readily are best wrapped and packed in single layers in trays.

As the month is usually a more or less wet one, the cultivation of the Orchard is apt to become somewhat neglected, owing to the impossibility of getting horses on to the land and to the rapid growth made by weeds of all kinds.

However, when the land is dry enough, cultivators fitted with surface knives should be used to cut down the weeds, and when such are too strong to be treated in this manner they should be mown down before they mature their seeds, and the trash buried by a shallow ploughing. In the drier districts, however, the cultivator should be kept going to retain the moisture in the land, especially after a rain, when the sooner the surface can be stirred after the rain stops the more moisture will be retained. Where needing it, citrus trees should receive an irrigation during the month—not a mere sprinkling, but a thorough soaking—as it is much better to give the trees a good watering and to be done with it than to be continually applying small quantities. Surface waterings induce the growth of surface roots, and this is a drawback in hot, dry districts.

Scale insects of all sorts attacking citrus or other evergreen trees should be systematically fought during the month by spraying or fumigation; and where spraying is used, it is advisable to use a poisonous spray that will destroy scale and leaf-eating insects at the same time.

The planting out of all tropical and semi-tropical fruits can be continued throughout the month during suitable weather—viz., dull or showery days. Mango seeds should be planted either in nursery or, where possible, where the tree is to be permanently located. Plant the seeds as soon as they are taken from the fruit, as if exposed to the air they rapidly dry out and lose their vitality. Don't plant seeds of any mangoes unless they are of extra quality and good bearers. There is far too much rubbish propagated for which there is no sale now; so if we don't want to increase this, only selected seeds of the best varieties should be planted.

Budding can be continued during the month, and the nursery will require constant care to keep it free from weeds, to see that all ties are cut, and, where necessary, that the buds are properly started and tied up, as, unless the young tree is properly started and trained to a single straight stem in the nursery, the grower has a difficult job to get it to grow into a decent tree when it is permanently planted out.

First plantings of strawberries for the production of early fruit can be made during the month. The land should be a rich loam, deeply worked and carefully prepared, and, where the same is available, should receive a good dressing of well-rotted farmyard manure, or, if this is not obtainable, then a dressing of 6 to 8 cwt. per acre of a mixture of Thomas' phosphate or superphosphate of lime or bones and sulphate of potash, in the proportion of 5 cwt. of phosphate to 1 cwt. of sulphate of potash. If possible, choose a piece of land that can be watered, and that is as free from frost as possible, as, if the winter and spring are dry, a supply of water for irrigation will be of the greatest assistance; and freedom from frost will secure early fruit. Obtain healthy runners, not old plants split up; and where the strawberry leaf blight is prevalent, remove and burn all old leaves on the runner, and dip the crown and remaining leaves, but not the roots, into Bordeaux Mixture to destroy the spores of the fungus causing this disease; and thus obtain healthy young plants to start with. Set the plants out in rows 3 feet apart and 1 foot apart in the row where the plot is to be worked by horse power, but where the labour is by hand 2 feet between the rows is sufficient. If the strawberries are to be irrigated, then the land must be graded level, and should be laid off in double rows, there being 4 feet between each double row, and 2 feet between the rows forming the double row.

The plants should be set on a slight ridge formed from the centre of the double row, which is thus lower than the plants, and forms a channel along which the water runs, and irrigates the plants on both sides of it.

The following are some of the best varieties of strawberries to plant:—Marguerite, Trollope's Victoria, and Pink's Prolific. Marguerite is early, and does well in fairly light loams, but is very subject to the leaf blight; still on account of its size and productiveness it pays to grow it, and keep it free from disease. Pink's Prolific is a very healthy, high-coloured, showy fruit—good bearer in rich volcanic loams. Trollope's Victoria requires a rich heavy loam to produce the best fruit, and when grown in such a soil it is a good bearer of large showy fruit. There are other varieties, such as the Captain, Edith, and Sharpless, that are worth testing, and some varieties of local origin that may turn out to be of considerable value for our climate, but until such are fully tested it is better to stick to the three first-named sorts when planting on a large or fairly large scale.

Farm Notes for February.

Farm.—During this month plough up and prepare the land for a potato crop. Small potatoes are the best for this planting, for if large they have to be cut up in sizes, and the chances are they will rot. Deep ploughing is recommended. If you have rich deep soil, clear of weeds, sow lucerne, but if weeds are still making their appearance in consequence of hot, muggy, showery weather, then defer the sowing until the ground is perfectly clear. Panicum, Cape barley, sorghum, vetches, Kafir corn, and imphee may be sown under similar conditions. Sow Swede turnips and mangel wurzel for early winter crop. Maize may still be sown, although, should frosts occur early in June, the ripening crop runs a risk of being damaged. Plant early potatoes, using bone-dust or short manure on the poorer soils.

Garden Notes for February.

Vegetable Garden.—Preparation must be made during this month for the main autumn and winter crops. All land intended for planting should be ploughed or dug up, and exposed to the weather in a rough state, only harrowing or raking each section as it may be required. Beds in which cabbage or cauliflower are to be planted should be heavily manured with well-decomposed stable or cowyard manure, which should be ploughed or dug into the ground. Extensive sowings may now be made of cabbage, cauliflower, and Brussels sprouts. The seed beds for these will require shading and plenty of water in dry weather. Swede turnips may be sown largely towards the end of the month ; also beet, carrots, onions, peas, radish, leek, and lettuce. French beans may now be tried with a bettter hope of success than during the hot, dry weather of last month. Potatoes can be planted at any time now, and should be put in whenever the ground is in good condition for planting. Cucumbers, melons, &c., should be in full bearing, and will want very little attention, except pinching back straggling shoots, removing all fruit as it ripens, and watering in very dry weather. Eschalots and potato onions may be planted in favourable weather. Weeds will now grow vigorously, and the hoes and cultivators will require to be kept constantly at work.

Flower Garden.—In the flower garden, chrysanthemums should now be growing vigorously, and should have plenty of water in dry weather. Should aphides attack the tender shoots, dust with tobacco powder, or spray with tobacco water or weak kerosene emulsion. Dahlias require looking after, tying up, and watering when necessary. This is a good time to plant out camelias, azaleas, palms, &c., as, if planted now, they will be enabled to make a good start in their new quarters before the cold weather sets in. Towards the end of the month almost all kinds of annuals may be sown for planting in the autumn. Among these may be mentioned snapdragons, daisies, candytuft, cornflowers, marigolds, dianthus, mignonette, *Phlox Drummondii*, annual chrysanthemums, lupins, sweet peas, &c. Most of these may be sown in the open ground, but it is better to have a seed bed with a light shade over it, and to sow the seeds in narrow, shallow drills. The ground should be well watered *before* sowing, as many of the seeds are very small, and liable to be washed out if water is given after sowing. It is best to soak the bed well overnight ; then rake smooth and sow in the morning.

Public Announcements.

The Editor will be glad to receive any papers of special merit which may be read at meetings of Agricultural and Pastoral Associations in Queensland, reserving, however, the right to decide whether their value and importance will justify their publication.

We shall be pleased to receive reports of the progress of Butter and Cheese Factories and Creameries for publication.

The *Queensland Agricultural Journal* will be supplied to all members of Agricultural and Horticultural Societies who do not derive their livelihood solely from the land, on payment, in advance, of an annual subscription of 5s.

GOVERNMENT AGRICULTURAL LABORATORY.

INSTRUCTION FOR THE COLLECTION OF SAMPLES, AND SCALE OF FEES.

GENERAL INSTRUCTIONS.

1. All analyses are carried out in their turn as they arrive at the Laboratory.

2. Should a customer wish for an immediate analysis, the fee, as provided by scale of fees below, will be increased by 50 per cent.

3. The samples may be forwarded by parcel post or by rail, either to the Under Secretary for Agriculture, Brisbane, or direct to the Chemist, Agricultural Laboratory, at the Agricultural College, Gatton; but in any case the required fee must be transmitted at the same time.

4. Analyses will be only carried out, if samples are taken strictly in accordance with the instructions issued below.

SCALE OF FEES.

	Farmers, Selectors, Gardeners. £	s.	d.
Soil—Short analysis (estimation of lime, alkalies, nitrogen, and phosphoric acid)	2	2	0
Soil and Subsoil—Short analysis	3	3	0
Soil—Complete analysis	4	4	0
Water—Analysis	3	3	0
Manures—			
Complete analysis	2	2	0
Nitrogen only	0	7	6
Potash only	0	7	6
Phosphoric acid sol.	0	15	0
Phosphoric acid insol.	0	15	0
Food Stuffs—			
Complete analysis	2	2	0
Water only	0	5	0
Albuminoids	0	10	0
Oil or fat	0	7	6
Ash	0	5	0
Fibre	0	7	6
Sugar-cane, sugar-beet, megass—Analysis of	1	1	0
Sugar, massecuite, jelly, molasses	1	1	0
Milk, butter, cheese—Complete analysis	1	0	0
Tanning materials (tannin estim.)	1	0	0
Soaps	1	10	0
Limestone, cement, clay, &c.	3	0	0

INSTRUCTIONS FOR TAKING AND COLLECTING OF SAMPLES.

SOILS AND SUBSOILS.

To obtain a fair average sample of the soil of a block of land, as near as possible, equal quantities of soil are taken from various parts of the fields.

A sketch plan of the field, paddock, or block of land on which the samples were taken should accompany the samples, and the spots where samples are taken are marked on this plan and numbered. This sketch plan should also indicate position of roads, creeks, gullies, ridges, general fall of the land, &c.

Should the soil in various parts of the block show a very marked difference, it will be necessary to divide the block into two, rarely in more, parts. Should the different soil occur only in a small patch, this sample may be left out.

Not less than three samples should be taken in each section. A greater number is to be preferred, as a better average will be obtained.

At the places chosen for the taking of the samples the surface is slightly scraped with a sharp tool, to remove any surface vegetation which has not as yet become part of the soil.

Vertical holes from 10 to 18 inches square are dug in the ground to a depth of 2 feet 6 inches to 3 feet.

The holes are dug out like post-holes; an earth-auger facilitates the operation considerably, and the holes may be trimmed with the spade afterwards.

Careful note of the appearance of the freshly cut soil and subsoil should be taken. The depth of the real soil, which in most cases is easily distinguished, is also measured and noted for each hole. Note how deep the roots of the surface vegetation reach into the soil. If the soil changes gradually into the subsoil, as is the case in some places where the soil is of very great depth, this line of division is guessed approximately, or it is best to take the soil uniformly to a depth of 12 inches.

With a spade a slice of soil is now cut off and put on to a clean bag. The same is done with the subsoil, and the slice is taken from where the soil ends (or 12 inches) to the bottom of the hole, and this subsoil placed on another bag. Stones over the size of a pea may be picked out, the rough quantity of such stones estimated, and a few enclosed with the samples. Fine roots must not be taken out from the soil samples. The same operation is repeated at the other places chosen. Careful note and description in each hole, as numbered and marked on plan given, and the samples of soil collected on the one bag thoroughly mixed by breaking up any large clods, and about 10 lb. of the mixture put into a clean canvas bag, which is securely tied up and labelled. The same is done with the samples of subsoil collected on the other bag.

All the samples collected are afterwards placed into a wooden box.

It is important to use clean bags and clean boxes, and also that the samples should not be left in the neighbourhood of stables or manure heaps. A short description of the land must accompany the samples and the sketch plan.

In the case of cultivated land, state how long the land was under cultivation, what crops were chiefly grown, result of such crops, was any manure applied, when, and what sort, and in what quantities per acre. In the case of virgin soil, state if the land was heavily timbered or not, ringbarked, if scrub or forest land, what sort of timber was chiefly growing on the land. In all cases a description of the neighbouring land, outcropping rocks, &c., are of great value. Also state if the land is naturally or artificially drained or not; describe the land as regards its position to hills, roads, creeks, ridges, &c. Only by adhering strictly to these instructions, and by giving minute details, benefit can be derived from the soil analyses.

WATER.

It is best to collect and forward samples of water for analysis in stoppered glass bottles, generally known as Winchester quarts.

The bottles have to be perfectly clean, and stoppers must fit well. Corks should be avoided, but if used must be new and well washed with the water before being used for closing the bottle.

When taking waters from taps, pumps, bores, the water has to be allowed to run for a while before taking the sample. When taking the water out of a well, pond, or river, the bottle is completely immersed, but care has to be taken not to disturb the mud or sediment at the bottom of the water. Before the sample is actually collected, the bottle is rinsed three times with the water, filling each time about one-third full. The bottle is then filled within about 1 inch from the top; the stopper is inserted and securely tied down with a clean piece of linen or calico.

The stopper must not be fastened or luted with sealing-wax, paste, plaster of paris, &c.

MANURES.

When taking samples of artificial manures out of bags, the sample must be taken from different bags and at different places of the bag and not only from the top, or the bags before being used are emptied on a heap and mixed up well and the sample then taken. About 1 to 2 lb. put into a clean bag should be forwarded for analysis.

FOOD STUFFS.

It is always important to obtain good average samples, and this can only be done by great care in taking the samples from different places, mixing well, and taking a small part of the mixture. This method would apply to any dry food-stuff—as grains of any kind, peas, beans, chaff, pollard, meal, &c. For the analysis of green foods—as green hay, sorghum, silage—it is best to make a mixture of the sample by passing it through a chaffcutter, and by taking an accurately weighed quantity—say 1 lb. This quantity may then be dried in the sun, taking care that nothing is lost, and when dry put in a bag and forwarded for analysis. The green samples may also be forwarded without drying in fruit-preserving jars.

To collect information about value of *green manures*, it is best to plot out exactly one square yard in the field covered with the plant, not picking out a position where the growth is very heavy or poor, but about a fair average. Four pegs are driven into the ground at the four corners, and string stretched between them; with a sharp spade all the plants are cut along the strings, so as to get really the growth of one square yard. The plants are all collected and accurately weighed, passed through a chaffcutter, and the sample for analysis taken as above described. In many cases the roots may be also pulled out, weighed separately, and a sample forwarded.

The samples have to be accompanied by a description of the crop—when planted, how old when cut, if the land was manured or not, weight of crop per acre or per square yard, and weight of the sample forwarded when in its green state. In the case of green manures it is generally best to take the samples at the same time when ploughed under, just after flowering.

By Authority: Edmund Gregory, Government Printer, William street, Brisbane.

Agriculture.

THE ASPARAGUS.

By HENRY A. TARDENT,
Manager of the Biggenden Experiment Farm.

This is another capital vegetable which should be grown on every farm—nay, in every household of our sunny Queensland. It originated probably in hot countries, being yet found growing in a wild state in the south of France, in Spain, in Italy, and in Sicily. It belongs to the botanical family of the Asparagineæ, comprising amongst others the gigantic *Dracæna draco* of Teneriffe, which is probably the hugest and longest-lived plant on our planet, and many other species, all endowed with some salubrious properties. The *Dracæna* exudes a bloodlike sap, similar to the sap of our Australian bloodwood, and is also possessed with astringent properties. The roots of another species (the *Cordyline*), are used against dysentery. The *Cordyline Australisa*, from New Zealand, has thick roots, called ti (or tee) by the Maoris, who use it as an esculent and prepare from it a fermented beverage said to be renowned for its anti-scorbutic properties. In Japan, the roots of the *Dianella odorata* are used to prepare some kinds of aromatic lollies. But no member of that interesting family can compare for usefulness with the ordinary asparagus which is known to botanists as *Asparagus officinalis.* In ancient medicine it was one of the five principal aperitive roots. Its berries and seeds were used as a diuretic. Its underground stems (turiones), although mostly used as an exquisite vegetable, are not without medicinal properties either. The chemists prepare from them a sedative or calming syrup frequently used in heart diseases. The extract to which the plant owes its principal properties is known under the name of "Asparagina," and is most abundant in a wild asparagus growing in Mediterranean countries (the *Asparagus acutifolia*).

The asparagus is also a rather ornamental plant. With its finely cut leaves relieved by numerous red berries it beautifies the garden, does well in bouquets, and is especially attractive on a well-dressed table.

On the Continent of Europe, also in many parts of America, the asparagus is considered one of the most delicate *primeurs.* When in season no dinner is complete without it. Here, in Australia, nine perhaps out of ten inhabitants have never tasted it—nay, have never seen it. Still, with a little care it could be grown successfully in any part of our island continent. It could be made a source of comfort and good health on every farm. In the proximity of a railway or of large cities it could be grown on a large scale, and make the fortune of many an enterprising market gardener, for no vegetable is a surer crop and more profitable to grow than the asparagus.

It grows best on a deep, rich friable loam free from stones. But with proper care it can be grown on a great variety of soils, not excluding rich heavy soils, provided they are not excessively clayey and sticky. A condition *sine qua non* of success, however, is a perfect and thorough drainage. In badly drained land the roots would be sure to rot and die out during our heavy periodic rainfalls. Neither can the asparagus be grown in a land which had grown asparagus before. The dejections of the plant make, so to say, the land asparagus sick for from ten to fifteen years.

There is, however, a peculiarity attached to this plant which makes it imperative to have the land deeply trenched and well pulverised. The subterranean part of the asparagus is composed of a kind of tuber, which the French call a paw (*la griffe*), having in view the shape of its lower part; whilst in English it is called a *crown*, on account of the tender stems, which start

upwards in a circular fashion like the spikes (?) of a crown. From that crown or paw radiate in every direction thick finger-shaped roots, called in fact fingers, which form a kind of inverted funnel. From those fingers innumerable hair-like roots plunge diagonally quite deep into the soil. Well, those fingers rot away every year, leaving only a kind of dry empty skin, pretty much like an ordinary sausage-skin, and are replaced by other fingers, which grow invariably *over* the dead ones, although starting from the crown too. The result of that strange phenomenon is that the plant rises every year in its place, and would be soon out of the soil altogether were not measures taken to meet that peculiarity. If the plant were left to itself, it would throw up a few shoots only, which would develop into stems, leaves, and fruit. But if those shoots are cut off when tender and just emerging from the soil the tuber will go on putting forth new shoots until at last a few are allowed to develop into stems. It goes without saying that such an extraordinary production is very exhaustive to the plant. In fact, it would soon perish or produce thin poor shoots were not the fertility of the land maintained by regular and copious manuring. Common salt and kainit are said to be good special fertilisers, but I prefer, when available, compost or half-rotted stable or sheep manure.

The wild asparagus of the old country has always thin shoots, but they are remarkably delicate and highly flavoured. The garden asparagus has much thicker shoots, and is consequently more profitable. The varieties mostly grown in Australia are the Cambden Park, the Erfurt Giant, the Canover's Giant, and a new variety—the Barr's Mammoth—introduced from America a few years ago by Mr. Searle, of Toowoomba.

If it is desired to save one's own seeds, some of the best and earliest plants should be allowed to develop their stems and seeds. As nothing shows which stem will develop into male flowers and which into female flowers, it is better to save a good many plants. Let the berries get thoroughly ripe. Then gather them, and soak them for about a fortnight in cold water to dissolve the mucilaginous matter which surrounds the seeds. Do not forget, though, to change the water at least every twenty-four hours, so as to prevent fermentation or corruption setting in. Then wash the seeds thoroughly in running water, and dry in a shaded but well-aerated place. If well cared for, these seeds will keep good for years.

But I do not think it pays to save seeds, unless one has an exceptionally good variety which it seems desirable to multiply. The better plan is always to apply to some reliable seedsmen, who have experts who make a specialty of that work.

Most seedsmen supply at reasonable prices not only asparagus seeds but also asparagus crowns, usually two years old, which come into bearing about fifteen months after transplanting. If you choose to raise your own crowns, then sow in the early spring—say from July to September—in any ordinary well-worked seed bed, in straight lines 2 feet apart and no less than 6 inches apart in the row, and cover slightly. It is always better to have them a good distance apart, for in that case their roots do not intermingle with each other, and there is no risk of breaking the fingers when lifting the plant for transplanting—an accident which is always injurious to the plant.

In that bed the plants can remain for two years without other care than to keep the land well pulverised and free from weeds. Too much water is rather injurious to them, and irrigation should be resorted to only in very dry weather.

For the permanent beds, secure first a good drainage either naturally or by artificial means. If it is intended to plant only a small bed for home consumption, trench it by hand for 18 to 24 inches deep, according to the nature of the subsoil, pulverise the earth and mix it with half-rotted stable or sheep manure. But if it is intended to work on a large scale for market purposes, then simply subsoil the land as deep as possible by the means indicated in my article on "Maize-growing" (see *Journal* for December, 1898). Then pulverise and mix well with half-rotted manure as above.

Now to prepare the beds. If you are situated in a dry district, proceed thus: Mark your beds to be just 4 feet wide. This allows space for three parallel rows of plants, the shoots of which can be gathered from both sides of the bed without treading the ground. Leave spaces, also 4 feet wide, empty between the beds. Now, on those rather wide footpaths, shovel back about 8 inches of soil taken from the beds. When working on a large scale, that earth can be thrown back by means of a wooden triangle drawn by a horse. Now fork again, and mix well with manure the land left in your beds, which is now a good deal lower than the surrounding land. Draw your lines, one in the middle of the bed and one on each side, 12 inches apart. On every place which is to receive a crown (a plant) put a shovelful of your best earth, forming thus a small hill. On every hill put the above-described inverted funnel-like crown, spreading well the fingers in every direction, and cover with some earth.* When the whole bed is finished, shovel back 3 or 4 inches of soil, and the work is is done. This transplanting is usually done in autumn and winter, say from May to August. When treated thus, the crowns usually begin to produce the second spring, say about fifteen months after transplanting. Now, during the whole life of the plants—from fifteen to twenty years—the work will consist simply in keeping the land clean from weeds and well pulverised by means of forks or some of the Planet Junior implements; and once a year, say in winter after the stems are cut off, take 2 or 3 inches of soil from the spaces between the beds and shovel it back on the beds with a good dressing of half-rotted manure.

If you are in a wet district or if you work with a rather stiff soil, the work will be the same in every detail except that the beds should on no account be lower than the surrounding land. They should start 2 or 3 inches higher, and be gradually raised every year.

To be successful, the transplanting should be done with great care, and the roots (crowns) should on no account be exposed to the rays of the sun. It should therefore be done either on an overcast, drizzling day or towards the evening. Great care should be taken not to break any part of the crown and fingers, either in lifting the plant or in setting it in its permanent place.

When the asparagus is grown on a large scale, the seeds are usually sown directly into the permanent beds prepared in the same way as above described. In that manner there is less labour involved, but the land is occupied for two years longer without any return. It is for everyone to reckon what will pay him best.

The harvesting consists in cutting off with a sharp knife—there are very handy knives for the purpose, slightly bent at the end—close to the crown from which they start, the young shoots (turiones), taking care never to allow them to grow more than 2 inches out of the soil, or they will become stringy and green. In that way the shoots are even, all being about 5 inches long. If that work is done carelessly, a great many young shoots will be injured, cut, or bruised, thus diminishing the crop. But with a little practice one acquires easily the required "knack." Those shoots are then sorted and tied in bundles ready for the market. When asparagus are large, they usually run from 70 to 80 to the bundle. Of the smaller ones there ought to be at least 100 in each bundle.

When the plant has given off nearly all its shoots it is of absolute necessity to allow three or four of them to develop into stems, flowers, and fruit. But they should be cut off and removed before the berries begin to shed their seeds; otherwise these will start growing in the beds like weeds, and seriously interfere with subsequent work.

The above-described methods have been found everywhere the most profitable and most congenial to the habit of growth of the plant. They insure also a first quality of products for which there is always a demand at remunerative prices. Still, it is possible to obtain half-crops of inferior shoots by

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* Were the crowns put on flat soil, the weight of the earth on them would cause the fingers to break, thus spoiling the plant altogether.

simply sowing in ordinary garden soil. In fact, in certain provinces of France he asparagus is grown in the vineyards between the rows of vines! It appears here is a custom there to plant, at the birth of a male child, one or two acres of land with both vines and asparagus, the returns of which are spent in rearing the child, whilst the land thus planted is handed to him at his coming of age. It is said that by that means one acre is sufficient to rear a man!

There can be no doubt whatever that asparagus cultivation is a most profitable form of farming. Its only serious drawbacks are the first expenses of establishing the beds (here in Australia it can be done for about £5 per acre) and the fact that the land is occupied for two or three years without giving any return. But this overcome, the remaining work is light, easy, and inexpensive. It consists in reloading the beds every year with some compost or half-rotted manure, and keeping the surface in good tilth. It is eminently a poor man's crop, giving large returns from a small area. It suits especially a man with a large family, as nearly all the work can be done by the weaker members of the family.

Much has been talked recently of women farmers in Belgium, in America, and elsewhere. Why should we not have women farmers in Queensland, too?* There are many branches of farming infinitely lighter, healthier, more pleasant, and more profitable than the so-called women's trades in our cities. Asparagus cultivation is one of them. Judge for yourselves. An acre under asparagus contains from 10,000 to 12,000 crowns, giving an average of twenty shoots each, making a total of 200,000 shoots per acre, or 2,000 marketable bundles. The price varies from 3d. to 1s. per bundle, or 6d. on the average, which means a money return of over £100 per acre, leaving, no doubt, a handsome margin for profit after having deducted the money for rent of the land, interest on outlay, labour, and incidentals.

There are, of course, many ways of preparing asparagus. As it is more or less a new vegetable to many, some recipes as used in my own household will be found on page 164.

I have tried to make the above notes as complete as possible, so that any man with ordinary intelligence could from them make a start in this profitable industry. Let now everyone try first on a small scale to get that thorough acquaintance with the subject—those little knacks which, in all branches of agriculture, practice alone can give. And it will not be long before the smartest member of the family will have discovered that the surest way to make *sovereigns* is to cultivate assiduously (asparagus) *crowns!*

MARKET GARDENING.

As much interest appears to be taken in asparagus-growing both for pleasure and profit, we append an article on the same subject by Mr. H. W. Gorrie, Horticulturist at the Queensland Agricultural College. The asparagus beds at the College have been very prolific, owing to the care bestowed on their preparation; and as Mr. Gorrie practises what he teaches, his notes on asparagus culture cannot fail to be of value:—

Asparagus officinalis is a native of the maritime provinces of Europe, and in its wild state is found growing close to the seashore, in saline and sandy soil. The fact of its native habitat being on the seashore has a considerable influence on the manner of its artificial cultivation. This vegetable has been cultivated from very ancient times, and is esteemed as one of the best and most delicate of all table vegetables.

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* Farmers' wives and daughters in Queensland would scarcely find time to attend to field work where there is a dairy, and where many household duties claim their attention. We have seen women and girls slaving in the fields in Germany, France, and Switzerland, but the British farmer prefers to see them in their legitimate sphere—that is, in the dairy, amongst the fowls, and carrying on those domestic duties on which depend so much the comfort of the field workers.—Ed. *Q.A.J.*

In Queensland, asparagus can be successfully grown in all the colder and medium warm districts, provided the soil is suitable, and either an abundant rainfall or a sufficient supply of water can be depended upon. About the profitable nature of the crop there is no question whatever, as the supply is very limited, and prices run from 6d. to 1s. 6d. per bunch. The best kind of soil is a sandy loam with plenty of saline matter in it; but almost any soil will do, if made loose and friable by deep cultivation, and enriched by abundant good manure. A deep sandy loam, if heavily manured, or a rich brown alluvial, will suit asparagus admirably. In preparing the ground, it should be worked either by trenching or subsoiling to a depth of not less than 18 inches some months before planting, and heavily dressed with well-rotted manure; and a few weeks before planting, a good sprinkling of coarse salt should be applied, and worked in by the fork or cultivator. If the soil is stiff and clayey, a few loads of sharp sand spread over it; and ploughed in will greatly improve it, and add considerably to the value of the crop.

Asparagus may be grown from seed, but it is better to buy crowns one or two years old and plant them. Seedlings require to be grown for three years before any crop can be cut from them. I should advise planting good strong crowns, which can be obtained at about 10s. per 100. June and July are the best months for planting, and at all events planting must be done before growth commences, which is in August and September. In planting asparagus on a large scale, it is best to plant in rows 5 feet apart, setting the plants 3 feet at least apart in the rows. For many reasons this system is much to be preferred to the old custom of making little beds. Before planting, open out a trench 6 inches deep with the spade or plough. Set the plants with their roots in the bottom of the trench, so that the crowns will be 2 or 3 inches below the level of the soil. Cover them right over by filling in the trench half-way or more, and, as the plants grow, gradually fill in the rest of the soil until the surface becomes level. This can be done gradually when hoeing and cultivating. Should the weather be dry, water must be given when the plants begin to grow, and the ground must be kept free from weeds.

During the first season none of the asparagus should be cut, the plants being encouraged to make as much growth as possible. A dressing of coarse salt or kainit at intervals of two or three months during the growing season will help the plants greatly. Sprinkle it over the surface of the soil, and then run the cultivator through the rows. In winter the tops will wither and dry up, and they must then be cut off and removed, and the rows forked or ploughed over, and a topdressing of manure applied to a depth of 3 or 4 inches over all the ground. In the spring this manure can be dug into the soil, and a good dressing of salt applied. The subsequent cultivation is the same as during the previous season, and if the asparagus bed is treated in this way every year, an abundant crop will be secured for many years. Asparagus properly planted in suitable soil, and accorded proper treatment, ought to last in full vigour for ten or twelve years.

In September of the second season, cutting may be commenced, and can be continued until the end of the summer; but every shoot which comes up must not be cut—some must be allowed to grow to enable the plants to perform their natural functions. Should every shoot be cut as it comes up, the plants would eventually die from the complete check to all natural growth which would take place. The young tender shoots are the part of the plant used, and these are cut when 4 or 5 inches above the ground. In countries where asparagus is a staple garden crop, the shoots are blanched by placing drain-pipes or flower-pots or pieces of bamboo over them as they come up. They are cut when 6 or 8 inches long, and are then white and very tender.

The requirements of asparagus, summed up briefly, are:—Loose friable soil, abundance of manure and water, and periodical dressings with salt or kainit. Superphosphate of lime may also be used occasionally with advantage, if it is desired to force a strong growth for any particular reason.

The variety chiefly grown is Canover's Colossal, which is the staple market variety. For home use Barr's Mammoth, which is very tender and succulent, is a good kind to grow.

There is no doubt that there are very large possibilities for asparagus-growing in this country. It is a vegetable which is hardly ever seen, and growers can command fancy prices, For market, the tops are tied in bunches about the size of a round pickle bottle, and the usual price here per bunch is 1s. or 1s. 6d.

USING ASPARAGUS.

Take a couple of bundles of asparagus, peel off the skins, rinse in cold water; tie again in small bundles, dip into boiling salted water; boil until tender, lift gently, strain, untie the bundles, dispose the asparagus artistically on a dish, the heads being turned towards the centre of the dish, and serve with some breadcrumbs browned in fresh butter.

Second Recipe.

Boil the asparagus in the same manner as above, and serve with white sauce.

Third Recipe.

Asparagus Salad.

Prepare and boil the asparagus as explained above; dish up in a deep dish, and cover with a sauce made thus: Put into a basin the yoke of a hard-boiled egg, rub it smoothly with one teaspoonful of sugar, a-half teaspoonful of fine salt, as much mustard or little pepper; add a tablespoonful of good pure vinegar, and one ditto of sweet olive oil; mix well, pour over the asparagus, and serve cold.

ELECTRICITY AND AGRICULTURE.

Science as applied to the operations of agriculture has for many years engaged the attention of enthusiastic experimentalists, and in many cases the results of applied science have been little short of marvellous. The idea of the application of electricity to growing crops is not by any means new. We have ourselves achieved good results by using it in connection with a crop of potatoes. The *California Fruit Grower*, writing on the subject, says:—

Perhaps the most extensive and conclusive experiments on the relation of electricity to plants growing were those of Dr. Selim Lemstrom, a physicist in the University of Helsingfors, Finland. He became convinced that the rapid growth of plants in the short summers of Finland and Spitzbergen was due to the highly electrified atmosphere. Laboratory experiments were so successful that in the summer of 1885 a field trial was made with barley. Part of the field was covered with parallel wires, about a yard apart, which were secured to insulators on low posts at the margin of the field. At distances of 18 or 20 inches each wire was supplied with metal points, through which a current could discharge into the air. The whole was connected with a Holtz electric machine, and the current was supplied from 6 to 10 o'clock in the morning and from 5 to 9 o'clock in the evening, from the middle of June until the first of September. The barley was well up when the experiment began, and at harvest time it was found that the yield of this portion of the field was 35 per cent. greater than the other; also that the quality was correspondingly improved. The following year the experiment was repeated upon a more extensive scale. In this case garden vegetables were the plants tested, and white beets, red beets, potatoes, radishes, parsnips, leeks, celeriac, turnips, and rutabagas gave increased yields in the order named varying from 107 per cent. to 1 per cent. On the other hand, carrots and kohlrabi showed losses of 5 per cent. and cabbages of 43 per cent. Further experiments with cereals and potatoes gave results that were considered very favourable.

At least one instance may be cited in which electricity has been used commercially. Near Boston a large grower has put the electric light to work in forcing lettuce so that a gain of at least two weeks on three crops is secured. Two lamps are hung above the house, and their effect is apparent for at least 100 feet.

ON MANURING.

All who derive either pleasure or profit from the tillage of the soil acknowledge the great importance of drainage and manuring. In this colony, however, little is done in either of these matters. The fact is that when land began to be taken up in the neighbourhood of our coast towns and on the banks of coastal rivers, the land selected was invariably rich scrub land, low-lying, subject to periodical inundations, and as a natural consequence of great depth and marvellous fertility. Some of the farms purchased in the early sixties are still producing good payable crops, and not an ounce of manure has been spread on them, if we except the ashes resulting from burnt cornstalks and weeds and the shed leaves of the lucerne plant. On such lands drainage was quite unnecessary, as no water would rest on a loose vegetable topsoil from 10 to 20 feet in depth.

The same reason for non-drainage and non-manuring applied to the deep black and red volcanic soils inland. But after the lapse of so many years, many of these latter soils, at least, have become poorer, and, as the more important constituents are exhausted, the soil has become less friable and more impacted. Hence the superfluous rainwater, instead of percolating through and passing away at a great depth into the watercourses, remains on the surface. The land gradually becomes sour, the crops look stunted and yellow, and the farmer comes to the conclusion that it is time that manure were applied in some form or other. Unfortunately, on impervious soils, or on extremely sandy soils, manuring without draining means useless expenditure, and many men, who have for years made a good living out of the land, in the days when it possessed all its good qualities, and when prices for produce were high, became alarmed at the great expense entailed by draining and left the land to take up virgin soil somewhere else.

Now, this is only history repeating itself. In all new countries when agricultural land is plentiful and cheap, men find it expedient to work out the soil, and then move further afield, or, if they have a large area of arable land, they abandon their first cultivation, use the land as cattle and horse paddocks, and break up virgin soil for cultivation. This obviously, under the conditions we have named, is, for many years, the best and cheapest course which can be adopted. It was so in America, in Canada, in South America, in Java, in South Africa, and doubtless our skin-clad forefathers in Europe did the same. In fact, Virgil, Cæsar, and other Latin authors have shown that it was so.

But to-day conditions are changed. Land is more valuable in the neighbourhood of cities, or near railway lines, and on navigable rivers. A farmer does not care to leave his old home on which he has expended hundreds, perhaps thousands, of pounds in the course of years, to go away to some far off inland country, however good the soil may be. It remains then for him to renovate the old soil and bring it back again to its original state of fertility.

This end is to be achieved by draining and manuring. But having been so long accustomed to do without these essential operations—essential to him now—he is possibly at a loss how to proceed, and this is where he profits by the work of experiment farms. Here it may be remarked that in all countries where experiment farms are established (and only the most backward countries are without them), it is never expected that they will pay directly. No direct profit is made out of them except under peculiar circumstances. But see how they pay indirectly. Lands have become poor, they are liable to be thrown out of cultivation, and to be left as storehouses for noxious weeds which

spread over the country, and are active agents in destroying the fertility of other lands. The experiment farm then comes to the rescue. It shows the farmer how he can overcome the difficulties which beset him. It points out what is wanting in his soil, it shows him how to improve it in the most economical manner, and thus is the direct agent in retaining the tillers of the soil on their old lands, and enabling them to add to the wealth of the country without going beyond their own district, whilst the new lands are left available for new-comers. In this way the experiment farms more than repay the cost of their maintenance.

Professor Paul Wagner, Ph.D., Director of the Government Agricultural Research Station, at Darmstadt, Germany, one of the greatest authorities on manurial experiments, lays down certain rules for carrying out experiments in this direction which are simple and clear, and restrict the experiments within reasonable and practical limits, which enable them to be undertaken by any practical, intelligent farmer.

Given that a certain portion of a farm has become unproductive, or was originally of such a nature as to be considered comparatively valueless for the production of payable crops, the question naturally arises, "Can the productiveness of any given area of land be increased by the application of manures of commerce?" By "manures of commerce" is meant, not farmyard manure, but what are known as artificial fertilisers—the principal of which are phosphate, nitrates, and potash.

How is the question to be answered? Professor Wagner says, "Make a simple experiment." Take two small plots of the land in question. Leave one of them without manure, and dress the other with some artificial manure containing nitrogen, phosphoric acid, and potash. Any difference in the yield obtained from these plots furnishes at once an answer to the question set. And, further, supposing an improvement in quantity or quality, or in both, to have resulted from the manuring, then, by comparing the cost of the manuring with the marketable value of the produce, an insight is obtained into the extent of the profit that might result by the adoption of the manure thus investigated.

Here are some examples of experiments made with the object of ascertaining the value of the fertilisers:—

1. A field of barley yielded per acre:—

	Straw. Tons	cwt.	qr.	lb.		Grain.
Manured ...	1	15	3	21	...	3,044 lb., or 56½ bushels of 54 lb.
Unmanured ...	1	1	3	8	...	1,999 lb., or 37 bushels of 54 lb.
Increase ...		14	0	13	...	1,045 lb., or 19½ bushels of 54 lb.

2. A field of oats yielded per acre:—

	Straw. Tons	cwt.	qr.	lb.		Grain.
Manured ...	2	1	1	10	...	2,676 lb., or 74½ bushels of 36 lb.
Unmanured ...	1	10	1	2	...	1,472 lb., or 41 bushels of 36 lb.
Increase ...		11	0	8	...	1,204 lb., or 33½ bushels of 36 lb.

3. Another field of oats yielded per acre:—

	Straw. Tons	cwt.	qr.	lb.		Grain.
Manured ...	2	19	2	26	...	3,481 lb., or 97 bushels of 36 lb.
Unmanured ...	2	11	3	2	...	2,810 lb., or 78 bushels of 36 lb.
Increase ...		7	3	24	...	671 lb., or 19 bushels of 36 lb.

4. A field of potatoes yielded per acre:—

	Tons	cwt.	qr.	lb.	
Manured	9	18	0	24	potatoes.
Unmanured	4	19	2	6	„
Increase	4	18	2	18	„

The next question the farmer naturally will ask is: "What about the cost of these fertilisers?" In reply to this we have the cost of the manuring, the value of the resulting increase, and the profit per acre in each of the above cases.

The following table sets forth (A) the cost of the manuring; (B) the value of the resulting increase; and (C) the profit per acre in each of the above cases:—

	A.			B.			C.		
	£	s.	d.	£	s.	d.	£	s.	d.
Experiment 1 ...	2	11	2	4	8	9	1	17	7
„ 2 ...	2	11	2	5	6	0	2	14	10
„ 3 ...	2	11	2	2	12	4	0	1	2
„ 4 ...	1	14	4	8	10	0	6	15	8

It will be observed that even such a simple experiment, in which the value of a complete manuring with nitrogen, phosphoric acid, and potash is compared with the absence of manure, effects a highly valuable revelation. In experiments 2 and 4 of the above examples the profits realised were exceptionally high, amounting to £2 14s. 10d. and £6 14s. 8d. per acre respectively; in experiment 1 the result was also satisfactory, £1 17s. 7d. per acre; whilst in experiment 3 the profit was only 1s. 2d. per acre, which shows clearly that the manuring had been too liberal for the land experimented on, and, therefore, the good effected was neutralised, as regards profit, by the unnecessarily large outlay for the manure. This may be distinctly seen by comparing experiments 2 and 3, which were made with the same crop and the same manuring.

If the Queensland prices are taken, it will be seen that the resulting profit per acre would be much larger. For instance, take experiment 4. There the increased yield amounts to very nearly 5 tons per acre. On the unmanured lot this would represent the whole crop, and would at present prices be worth about £40. On the dressed plot the yield is nearly double or about £80, whilst the actual cost of the manuring only amounted to £1 14s. 4d. per acre, the fertiliser being applied in the following proportions:—

	On a Plot of 121 Square Yards.	Per Acre.
		cwt
Nitrate of soda	2	... $\frac{3}{4}$
Thomas' phosphate powder ...	12	... $4\frac{1}{2}$
Sulphate of potash	3	... $1\frac{1}{4}$

At the prices per cwt. given in the February number of the *Journal* in reply to a correspondent (in which by the way an error crept in giving the price per sack, instead of the price per cwt., corrected in this issue), the cost of the mixture per acre would be £1 14s. $7\frac{1}{2}$d.

Of course it may happen that the soil in question is not deficient in one of the ingredients or perhaps in two. In such a case a portion of the land should be divided into several plots. It may be thought that plots as extensive as $\frac{3}{4}$ or at least $\frac{3}{8}$ of an acre offer the best guarantee for trustworthy results. But this is not the case. It is difficult to find 3 or 6 acres in a field, capable of being divided into 8 plots, which would be so similar to each other in condition that any variation in harvest obtained from them could unhesitatingly be attributed to the action of the various manures employed.

As a matter of fact, experiments conducted on plots 121 square yards in extent have, as a rule, been found to give much more accurate and reliable results than those obtained on larger plots.

At the Hermitage Experiment Farm, near Warwick, during the last season, experiments were made on 40 plots ranging in area from $\frac{1}{2}$ to $\frac{1}{8}$ of an acre and 403 named varieties of wheat on these plots occupied an area of about 18 acres. But certain alkali patches interfered with the experiment here and there.

There is but little difficulty in finding $\frac{3}{4}$ of an acre in a field that can be divided into 25 plots sufficiently uniform in condition; and then the cost of the manures is so small, that it is just as little worthy of being taken into consideration as the somewhat reduced yields from the plots that are not manured, or are insufficiently manured. So, too, the operations of weighing, mixing, and distributing the manures, the labour of harvesting, the recording the harvested weights, &c., &c., are very much lighter than is the case with larger plots.

The next point to engage our attention is, when and how to apply the manure.

The phosphate and potash (in the case of oats) should be mixed, and spread at latest before working the soil in the spring.

The nitrate should be applied half at the time of sowing the seed, and half as top-dressing four weeks later.

When barley is sown with lucerne or clover, the phosphate and potash should be applied as for oats, but the nitrate is to be sown with the seed. As a matter of course, the action of these manurings will not be restricted to the barley, but will be observed, and should be recorded, in connection with the following crops of clover or lucerne, inasmuch as it may happen that prominent activity on the part of the phosphate powder may show on the clover, but not on the barley. In the case of mangel wurzel or sugar-beet, the nitrate is applied half when sowing or planting out the mangels; the other half at the first hoeing. When applied to potatoes, if kainit (potash) is used, it must be applied to the preceding crop and not to the potatoes direct, whilst the nitrate is applied half when setting the potatoes and the other half at the first hoeing.

Now what about lime in the soil? No cognisance has been taken of this constituent in the professor's experiments here quoted, but an approximate estimation of the amount of lime in a soil can very easily be made by the farmer without the assistance of the chemist.

About a teaspoonful of the soil is placed in a suitable glass vessel, and upon it is poured a mixture consisting of 1 part of concentrated hydrochloric acid and 2 parts of water. If there is a distinct evolution of gas bubbles (bubbles of carbonic acid gas), or a definite effervescence, it is quite certain that the soil is rich enough to meet the lime requirements of plants. If, however, there is a very feeble evolution of gas bubbles, or none at all, then lime may be deficient, in which case it is advisable to supplement the manures in the eight plots above mentioned by two or three plots, to be dressed each with 40 lb. (about $14\frac{1}{2}$ cwt. per acre) of lime, and also to add a similar quantity of lime to the unmanured plots. Powdered lime is met with in commerce; but if lime in lumps is used, the lumps are put in a wicker basket and dipped under water for about half-a-minute. The lime is then cast on a heap and left to slack until it falls to a dusty powder, which is filled into a sack, and spread over the field in the autumn or during the winter months, being cautiously mixed with some moist soil before spreading, so as to avoid dust flying during the operation.

Suppose a field, say of turnips, to have reached the period of the last cropping before the renewal of a dressing of farmyard manure. Such a field will have attained a maximum degree of exhaustion, and it is obvious that that portion of the field that is in the poorest possible manurial condition should be selected for the experiment.

As a matter of fact, impoverished land of the character above set forth should be specially selected, where possible, for all experiments that are mainly directed to show the effect, in extent and activity, of manures when used alone or in mixture on a particular crop. But with this special object in view the field selected should not only be in the impoverished condition just described, as regards fertilising constituents, but at the same time its physical condition should be such as to render it capable of bearing the heavy harvests anticipated from the appropriate manuring, which it is the object of the experiments to indicate.

It has been stated that the salts require to be mixed. To effect this, Professor Wagner sifts them through a sieve with holes $\frac{3}{20}$-inch in diameter, to ensure sufficient subdivision of the manures.

This being done and a sample taken for analysis, the rest is mixed with peat dust which has passed through a sieve of the same dimensions, although Mr. D. A. Louis, F.I.C., F.C.S., the translator of Professor Wagner's pamphlet, says that $\frac{1}{6}$ or $\frac{1}{8}$ inch mesh would do as well. The dust is added in the proportion of 1 part to 10 of the salts. The mixing is then effected by shovelling together, sifting, and again shovelling together. In use, 11 lb. of the mixture is equal to 10 lb. of the salt.

The use of the dust is to facilitate the thorough mixing of the salts with Thomas' phosphate powder, and also, when kainit is a constituent, to prevent such a mixture from setting hard.

SPREADING THE MIXTURE ON THE LAND.

If the mixture is so dry that it is likely to be blown about when being sown, it must first be thoroughly mixed with moist soil. This admixture must be made with great care, and, to ensure thoroughness, the manurial mixture must be transferred repeatedly from one tray to another and each time mixed with the hands. Loss in dust during the sowing must be prevented.

The spreading should be done by an experienced sower, who, however, must not take such wide swings as are required when sowing on larger areas. Wrist movements are what are required, not arm movements, and the whole of the surface of the plot, right up to the boundaries, must be covered with the manure as uniformly as possible. On approaching the boundary the sower should stoop, thus bringing his hand near the ground.

No spreading should be done in windy weather; but if absolutely calm weather cannot be chosen, the spreading must be conducted with the greatest care, and the sower's hand kept the whole while near the ground.

Nor must the manure be spread just after rain, nor on bedewed ground; the soil should, in fact, be sufficiently dry not to adhere.

When nitrate of soda is used as a top dressing, one must be very careful not to spread it on the plants when they are wet with rain or dew. If the plants are not thoroughly dry the nitrate will have a corrosive action on them.

The results of the application of fertilisers will satisfy most farmers as to whether it will pay to use them or not, but it is decidedly advantageous to submit samples of harvested produce and also a sample of the soil to an agricultural chemist of recognised ability. The soil should be taken from the unmanured plot after the harvest.

Full instructions for taking and collecting samples of soils and subsoils, and for their transmission to the Government Agricultural Laboratory at the Queensland Agricultural College, at Gatton, are given in each issue of the *Journal*, together with a full schedule of the fees payable for analysis.

MAIZE AS ENSILAGE.

LAST month we dealt with the disposal of the early maize crop which was so disastrously affected by the late drought. We recommended the building of ensilage stacks where no silo building is available on the farm. At the

Queensland Agricultural College three large silos have just been filled with chaffed maize stalks, the cobs on which had just passed the milk stage. Nearly 200 tons of excellent ensilage are now stored away in readiness for any emergency such as a flood or further drought.

On the subject of ensilage the *Leader* says:—"Maize is different from other crops, such as wheat, oats, or grass, with regard to the time of cutting for ensilage. These latter can hardly be cut too green, as long as they are allowed to reach the earing stage; but it is different with maize, which, if put into the ensilage stack too green, has all its substance pressed out and wasted."

On this point, Mr. John Blencombe, of Myra Vale, New South Wales, describes how his first attempt at maize ensilage turned out a failure. He says:—"The ensilage became quite dark, and a quantity of water ran from it. I have since found out that the cause was from the maize being cut too soon; but last season I made ensilage from maize, planters' friend, and sorghum, which has been a thorough success, as nothing better could be desired. Several farmers have been to see it, and they all state it is the best they ever saw. The Johnson press (wire bands tightened down with ratchet and lever) was used on this occasion, and the ensilage is good to within 3 inches of the outside of the stack, so there is very little waste. The cattle eat it with avidity, leaving none. I find the maize ensilage is superior to planters' friend. The milking cattle do better on the maize, giving a greater flow of milk than when fed on planter, so in future I intend to grow maize only. The stack contains from 80 to 100 tons, and the maize was put together just as the milk had gone off the grains. This is worth knowing, as we have tried it at several stages of growth, and a great deal depends on the time when it is cut to make a good article. The stack was put together in twelve days, and the wires were tightened twice a day for the first six days after it was built, and once a day for the next six days, and after that once every three days for a month. This is of great importance, as it depends on the attention it gets for the first twelve days, whether the ensilage will be a success or not. If farmers are desirous of making a first-class article, and they attend to the time of cutting and to the pressing, they cannot fail in making the ensilage a success. I give you this experience after some years of experiments."

WHEAT AND MAIZE ON THE DOWNS.

WHEAT.

Now that the wheat harvest for 1898 is over, and a pretty correct estimate can be formed of its results, we may congratulate the farmers as a body that the losses due to the dry weather have not influenced the yield in such a disastrous manner as was expected. Indeed, a return of 600,000 bushels, considering the great drawback of want of rain, is something to give general satisfaction.

In New South Wales, Victoria, and South Australia the aggregate yield of wheat is far in excess of the requirements of those colonies, more especially in Victoria and South Australia, in each of which colonies it is an acknowledged fact that the surplus is very large.

The markets for this over-supply must, therefore, be the other colonies, Africa, and England.

The keen competition between rival steamship companies trading between Europe, Africa, and Australia has resulted, as a natural consequence, in very low rates of freight, and the Brisbane millers naturally have taken advantage of this, and have arranged for freight at unprecedentedly low rates.

We hear of freights having been taken as low as 4s. 6d. per ton of 2,240 lb. between Melbourne and Brisbane. When we contrast this remarkably low figure with the freight demanded by the railway authorities on wheat between Brisbane and Warwick, which amounts to 12s. per ton, we cannot help arriving at the conclusion that the wheat farmer of the Darling Downs is too

tremendously handicapped to enable him to find a profitable market outside his own particular district. There is no doubt that it will not pay him to send his wheat to Brisbane. The Brisbane millers must then buy their wheat in Melbourne, paying at the present moment 2s. 5d. to 2s. 6d. per bushel, and with the low freights and the payment of 4d. per bushel duty they are landing wheat of even better quality than our own in their mills at Brisbane at a much cheaper rate than they could obtain it from the Darling Downs.

There, the present value is from 2s. 8d. to 2s. 9d. at Warwick, whilst the price at Toowoomba ranges from 2s. 10d. to 3s., the latter price being paid for the very best sorts of the hard varieties of wheat. We have it on very reliable authority that there is abundance of wheat now held on the Darling Downs between Toowoomba and Killarney to keep the local mills in full work throughout the year, whilst the Brisbane and the Northern millers are debarred from drawing any supplies of grain from the Downs for milling purposes.

In the neighbourhood of Allora and Clifton Back Plains the wheat crop, owing to the absence of rain during the past abnormally dry season, may be considered as having proved a decided failure. Of course there were some good fields of early planted wheat, which well repaid the farmer for his labour, but, taken as a whole, these districts did not produce sufficient wheat by a long way to give even the semblance of a successful harvest, and thus in any case the average production here must be a very low one.

On the other hand, Toowoomba, Pittsworth, Jondaryan, Gowrie, and Meringandan, whilst not getting a return quite up to what they have had in previous years, yet, owing to the late rains on the plains in those directions and round Warwick, especially on Swan Creek, Emu Vale, Yangan, and Killarney high lands, the farmers in these districts have been enabled to harvest a crop decidedly above the average.

Now let us see, in support of our contention that Brisbane is a poor market for wheat from the Downs, how much wheat has actually been purchased by Brisbane millers up to date, 18th February, from over the Range. We have it on the most reliable authority that the coast mills have only purchased about 5,150 bushels, and much of this is more for horse feed than for milling purposes, although it was lately stated that these mills had purchased 10,000 sacks or 40,000 bushels. Some of the Downs mills do not grist more than 15,000 sacks in the year, and between them they now hold some 30,000 sacks. From inquiries we have made from the most reliable sources, we can only come to one conclusion, and that is that there is quite sufficient wheat now on the Darling Downs to run all the local mills throughout the year.

MAIZE.

Until about three weeks ago, the continued dry weather, almost unprecedented at this season of the year, had a most disastrous effect upon the early planted maize, and quite justified our prediction that there would be little or no maize crop, at all events from early-sown fields, and indeed the outlook was none too promising for the later-sown crops on the Darling Downs, as well as on the rich plains lying between Laidley and Murphy's Creek. The recent bountiful rains, amounting to from 10 to 12 inches, have, however, most wonderfully improved the late maize crops in all parts of the colony and on the Downs. This is more especially noticeable along the sides of the Range, and particularly in and around Freestone Creek and away towards the Condamine River, on the spurs of the ranges. The appearance of the crops fully justifies us in expressing the expectation of a very fair and reasonable crop in the near future on the Downs proper—on the rich alluvial and volcanic plains. But we must point out that in some cases there will probably be disappointment, owing to the recent favourable weather inducing farmers to sow maize which cannot arrive at maturity before the frosty weather sets in.

To revert to the matter of wheat-growing: Since the rain the farmers have been generally busily ploughing and getting their land into proper order with a view to early wheat-sowing. This early sowing we look upon as the greatest safeguard to successful wheat-growing.

The best varieties of hard wheats for April sowing are Defiance, Talavera, Purple Straw, Belatourka, &c., whilst for late sowing the Spring wheats may be sown during May and June, should the rainfall be sufficient, and in such case even as late as July. Farmers who sow hard wheats earlier than June are only courting disaster.

SEED WHEAT.

SEED wheat obtained from a cold climate will, if taken to a warmer locality, and sown under conditions required for it to hold its own, develop and mature a crop much quicker the first year than seed saved where the growing season is twice as long. This is the experience of Mr. R. W. Dunham, communicated to the *Agricultural Gazette* (London). Professor Petermann made a series of trials in Belgium in this direction, and found that seeds gathered between 55 degrees and 60 degrees north latitude are distinguished from seeds of the same species grown in more southern latitudes by their superior germinating power, their vigour, and their superior weight.

The advantage, therefore, to be derived from a change of seed arises mainly from the fact that in certain localities the climatic requirements, the nature of the soil, and the nutriment in the atmosphere are not correctly valued for the full development of some seeds, so that, in order to obtain a crop, preference has to be given to varieties which come from a better soil and climate.

A case showing rapid change is then mentioned. Some remarkably fine samples of white wheat, weighing 66½, 67, and in one case 68 lb. per standard bushel, procured from Australia, were sown in England in an unfavourable district for that class of wheat, and the result was that so rapidly did the wheat deteriorate that after three years of cultivation the produce was little better than "chicken food."

Again, in the selection of pedigree or cross-bred wheats for seeds, the attention of the cultivator should be confined to such descriptions or varieties with good gluten as will, with proper care, reach the highest limit of quality in the locality where they are to grow. To adopt any wheat on outward appearance is very ill-advised, unless the precaution has first been taken of ascertaining whether that kind of wheat is hardy, and whether the straw is strong enough to carry the ear without bending, and, besides this, the class of soil and climate it has been used to. The virtue of cross-bred or pedigree wheat resides in the almost invisible germ, and is an impress from consecutive generations. It may exist in a thin kernel equally with a plump one; but the farmer has another matter to consider which we have repeatedly drawn attention to in the course of these articles—namely, that of the necessary nourishment for the young plant. It is strange, but the miller requires the exact composition of the grain that the wheat plant requires for its proper food. And it should be borne in mind that these special wheats make a rapid reversion, and will, after careless growing for two or three years, become as thin and wretched as any other variety. We have seen fields of pedigree wheat germinate very weakly, the plant remaining weak throughout its growth, yielding a poor yield at harvest, and not the miller's good sample either for quantity or quality of flour.

SEED PLOTS.

Every farmer who grows wheat should, before harvesting it, make it a matter of duty to go through his wheat fields and select a good-looking plot for the seed patch, from which he should remove all undesirable plants, especially those having short and poor ears. This patch of wheat, when harvested, should be so kept and stacked that when the year has gone round it can be thrashed by itself, and when dressed—just previous to sowing—extra care should be taken to separate the light kernels from the heavier grains, reserving the best only for seed. By following this course for a few years great improvement will result, and the farmer will establish a valuable strain of wheat. In conclusion, we must point out that on no account should the common practice of sowing new wheat that is the produce of the recently-finished harvest be pursued, as wheat is never fully matured in ripeness until a full season has passed. And the same seasonal influences are necessary to mature and perfect in strength the germinating principles which would be manifest by a stronger straw, longer and better-set ear and finer type of grain. That this is a fact can be easily shown by examining the following table and remarks of an experiment carried out by the writer for a large firm of milling engineers, who wished to prove that wheat could be artificially matured and improved in the mill by machinery which manipulated it so that it came under the influence of moisture, heat, and cold. In this test the wheat was grown in Yorkshire, and one sample was ground by the writer, and the other, after being "conditioned," submitted by the writer to the same process of reduction. The chemical test showed the following difference, and demonstrates the utility of keeping wheat one year before sowing it a seed :—

	Wheat not kept.	Wheat conditioned.
Sugar	2·51 per cent. ...	2·59 per cent.
Soluble extracts	5·48 ,, ...	4·88 ,,
Total albuminoids ...	12·00 ,, ...	11·00 ,,
Soluble albuminoids ...	1·00 ,, ...	·40 ,,

The above figures point to the fact that the "conditioned" wheat was increased in milling and baking value above the wheat ground into flour as it was received from the farmer in the early autumn, by reason of it having less soluble albumin to hinder fermentation in the process of being made into bread, and in the case of germination less soluble albumin means less hindrance in the process of breaking down the endosperm, and more sugar in the flour to improve the fermentation, also a better gluten to retain water in the bread. Both these latter good points are also required in the seed to invigorate the very young plant.

CHAMPIGNONS.

In the June number of the *Journal*, 1898, we describe the method of growing mushrooms artificially. The present article deals with the French mode of growing champignons. Although the latter is a kind of mushroom, it is much more slender in the stem and cap, more delicate in flavour, and fetches a higher price in the market. It is difficult for a novice to tell a champignon from some of the poisonous fungi which resemble it, but, in common with the mushroom, it may be known by its liver-coloured lobes, and by its peeling easily.

The champignon, as well as the mushroom proper, is cultivated in the environs of Paris, in old disused pit quarries, which are honeycombed with galleries, affording exactly the conditions of temperature, moisture, and darkness favourable to the growth of these excellent vegetables.

Some thousands of persons are engaged exclusively in their production, which amounts annually to 10,000,000 kilogrammes (about 1,450 tons), valued at 12,000,000 francs (£480,000).

The champignon only develops itself on horse manure, and that is a manure of special quality which has been subjected to a particular system of fermentation, being piled up at the entrance to the champignon beds in long mounds about 5 feet in height. If the mounds were lower, the mass would not heat sufficiently; if they were higher, it would heat too violently. When the manure has been three weeks in the mounds, it is ready for the production of the fungus.

What essential change has been produced during this fermenting period? The labours of several scientists, and particularly of Dr. Repin, of the Pasteur Institute, have resulted in establishing the fact that the straw in the manure has undergone a chemical oxidation. The cellulose has been transformed into an insoluble substance, and it is this insoluble substance which furnishes the champignon with the element necessary for its nutrition and development. In fact, we see that the "spawn" is produced in the same manner as for mushrooms.

The manure having been thus prepared, it is lowered into the abandoned quarry or mine, which is chosen as the site of a "champignonnière," as the French term it. These are of several kinds. In some the galleries are narrow, and so low that they can only be traversed on "all fours." These galleries or tunnels ("drives," we should call them here) are reached by a shaft, which is descended by means of a "parrot ladder"—that is, a single piece of timber pierced with holes, through which short pieces of wood are passed, protruding on both sides. Other quarries and their galleries are so immense that there are several workings one below the other, and each reached by a winze. Now, in these galleries many operations are carried out before the precious vegetable is raised to the light of day.

First comes the laying down of the manure in regular lines, about 16 inches wide at the base, and the same in height. These dimensions have been fixed by experience, and are such as to permit of the mass fermenting again in a slight degree, and to reach, without passing a temperature of 18 to 20 degrees Cent. (about 64 degrees to 68 degrees Fahr.), which is the requisite temperature for the proper development of the champignon.

Immediately after the arrangement of the manure in these lines, the "spawn" is sown; this is called the "lardage." Small pieces of prepared dry manure called "sets" are put into the rows of manure. These are charged with the champignon "spawn." This spawn, from which the champignon is to eventually be produced, has the appearance of very fine white threads, which, when set in the manure, spread themselves in all directions through it. The spawn is rather expensive to purchase. A basket of twenty "sets" costs 3½ francs (2s. 11d.), and it takes five "sets" per yard to properly sow the hillocks. The search for the virgin spawn is a separate industry. It is found in old abandoned manure heaps, and in old melon beds, where it is spontaneously produced. Scientists have, however, discovered a method, hitherto vainly sought, of obtaining a virgin spawn direct from the spores of the fungus itself.

Now come the final operations. The surface of the hillocks is worked about by hand to give it a good tilth; then comes what is locally known as the "goptage." This operation consists in covering the surface of the beds with sand spread to a uniform depth of about ½-inch. The action of the sand is purely physical, and provides no nourishment to the fungus.

Three or four weeks after the "goptage" the champignons are at maturity nothing remains but to gather them.

During the period mentioned, the hillocks must be kept in a certain state of humidity by watering.

Champignons, which have none of the constituent of daylight plants, known as "chlorophyll," breathe like animals. They absorb oxygen, and expire carbonic acid. Hence it becomes necessary to supply the oxygen needed for their respiration. In addition to which it is indispensable to keep the atmosphere surrounding them at a temperature of about 64 degrees Fahr.

To compass this double end, a permanent system of ventilation must be provided in the quarries to avoid sudden changes, especially a great reduction of temperature. This is done by means of chimneys carried up from the galleries. At the base of these chimneys great fires of coke are kept constantly burning, as in the case of ventilating a coal-mine.

FARM BOOKKEEPING.

The need for farm bookkeeping of some sort is very generally recognised; and the following suggestions are made for the purpose of helping those farmers who may desire to initiate a system of bookkeeping, and it is thought that, with some alterations to suit individual circumstances, they may serve as a guide to farmers to ascertain how they stand from a commercial point of view, instead of relying, as the majority do at the present time, upon the balance in their bank accounts.

Valuation.—A business man who desires to know how he stands, in his business and with the world, commences by making an inventory and a valuation of his stock. The farmer must do the same, but his inventory and valuation will be much more varied, for they cover everything in connection with farming, live stock, crops, fencing, buildings, land, &c., &c. The valuation and inventory having been made, it will be necessary, before attempting to make out a balance-sheet, to ascertain the state of his liquid assets and liabilities as disclosed by his transactions with the bank with which he trades, his store accounts, blacksmith and other liabilities for which he may be responsible, and the debts that may be due to him. It is not possible to enumerate in a short article all that may have to appear on the debtor or credit side of the balance-sheet, but the following headings practically cover all that may be necessary, and if, in dealing with each one, some thought is exercised, all the items that should appear will be recalled to mind, for they are very general in their influence.

These are—Cash in hand.

Cash at bank.

Debts owing to the farm.

Debts owing by the farm.

The above having been properly set out, and made as far as possible correct, a trial balance may be taken in the following form to find out the financial position at the time, but it must be clearly understood that this balance does not give the balance of gains or losses upon the transactions of the year immediately preceding the compilation of the balance. It is, in other words, a statement of liabilities and assets.

BALANCE-SHEET TO

LIABILITIES.		ASSETS.	
Debts owing by me as per list	£	Cash at bank	£
Bank overdraft (if any) ...	£	Cash in house	£
Balance being by capital at this date	£	Valuation as per list ...	£
		Debts owing to me ...	£

To know the result of the year's transactions and to supply the link with the balance-sheets at the beginning and end of the period, it is necessary to keep a profit and loss account, which is practically a summary of the business transactions for that period. The business a farmer does with the outside world is mainly for cash either for present or future payment, consequently it is evident that a cash account must be the backbone of the system, and that a correct cash account is essential to a true account of the profit and loss. The cash account is then the first point to insist upon in farm bookkeeping; and if a bank account be kept, it will be found to be a great convenience and safeguard. Let all the payments and receipts, wherever possible, pass through the bank account, but also let all particulars of receipts and payments be first entered in the cashbook, and, if it be not possible at the moment to do so, they should be entered in a notebook, to be transferred to the cashbook at the first opportunity. If the payments are by cheque, the particulars in the counterfoil will give the necessary information for the cashbook. The bank passbook should, from time to time, be compared with the cash account, and any corrections made that may be required. Where no banking account is kept, the farmer cannot be too particular in seeing that all transactions are entered as they occur, for the safeguard of the banking account will in such cases be wanting. The balance of the cash account, if the receipts exceed the payments, should be the same as the credit at the bank, or, where no banking account is kept, as the cash in hand; but this balance is not, of course, the exact balance of the profit and loss for the period. For it may be that some or the whole of the money at the bank is borrowed money, or there may be an overdraft at the bank for the purpose, say, of improvements. To produce a profit and loss account a further step is necessary, and that is to summarise the cash entries under the various heads of receipts and expenditure, distinguishing what are merely expenses from payments for purchases or improvements. This summarising is generally done by means of a ledger to which the various accounts are posted, but a plan, where establishments are not large (and it is for such that this paper is written), is recommended—viz., to provide extra columns in the cash account for an analysis of the entries, a plan which will be better understood by the following example:—

CASH ACCOUNT.

RECEIPTS.

Date.		From Whom and Particulars.	Amount Received.			Analysis of Receipts.											
						Crops.			Live Stock.			Dairy and Poultry.			Sundry.		
			£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.

PAYMENTS.

Date.	To Whom and Particulars.	Amount Paid.			Analysis of Payments.														
					Crops.			Dairy and Poultry.			Implements.			General Expenses.			Household Expenses.		
		£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.

The above headings are not, of course arbitrary, but are suggestive merely, for the headings can be arranged to suit local circumstances. A cash account compiled upon the basis of the above specimen will show at a glance what are the receipts or expenditure on account of the different departments of farming life. With regard to the column for implements under the heading of payments, only the cost of new implements should be charged thereto; repairs and renewals would naturally come under the head of general expenses; indeed, what cannot be charged to household expenses or to specific branches of the farm comes under that heading. The analysis of the cash account and the profit and loss account, which is based upon it, will, it is thought, be more valuable if the wages of the hands be divided over the different columns. To facilitate the division of labour and to prevent unnecessary entries in the cash account, a separate account of labour should be kept, and only the totals for each week or period fixed upon should be entered in the cash account. The totals of the pages of the cash account should be continuous, the correctness of each page being tested by the cross cast of the analysis columns, so that when the time arrives to strike a balance the total receipts and payments under each heading will be given. These totals form a very reliable and important basis for the profit and loss account, and are arrived at without the trouble and delay of ledger posting that is so necessary in commercial life.

The cash account, of course, only refers to monetary transactions, but there are many other things on a farm which require adjusting before a balance can be properly arrived at. For instance, the transfer of the value of live stock from one branch or department of a farm to another, debts to and payments that have been made in kind, but not by money—manure from the yards to the paddocks, &c., &c. Transactions of such nature may be set right by a note being taken at the time in a pocketbook or daybook of their market value, and at the proper time credited and debited in the cash account. For an example, take the manure from the yards. This should be credited to the live stock, and debited to the crops or rather to the paddock it is to benefit. The reason for this is that in reality the manure has been sold from part of the farm and brought by another part, just as much as if it had been purchased from an outsider.

In the same way should all the produce consumed be dealt with. Household consumption from farm produce likewise comes under the same category. The benefits to be derived from such a system can be summarised thus—(1.) Though the amounts involved in accounting the transactions increase both sides, the general balance of receipts and payments and of profit and loss is not affected, but the results of each department are corrected thereby. (2.) The total amount owing to and by the farmer can be best shown on the face of the profit and loss account as detailed in the specimen form. In the specimen profit and loss account it is assumed that a valuation is made at the end of each year, the amount being credited to the account of the expiring year, and brought forward to the debit of the coming one. If it be desired to compile a "capital account" each year, the household expenses should not appear in the profit and loss account, for, properly speaking, they are not part

of the farm—they should, however, appear in the capital account as shown in the specimen form. The foregoing plans and explanations will, it is thought, if followed out, be found to furnish a simple plan of accounts based upon reliable entries, that will be sufficient for the ordinary farmer to keep track of how he stands with regard to his worldly goods and chattels, and enable him to know whether, financially, he is solvent or insolvent. Every care has been taken in this paper to portray a system clear from the complicated system of commercial life. If such be needed, as it would be in a large establishment, trained men would be of course necessary for the purpose, but in the scheme here set forth the farmer and his family have alone been kept in view. It will have been noticed that the specimen accounts provided do not include the personal accounts of those with whom the farmer has dealings. Should it be thought desirable, it is presumed that separate memoranda of them will be kept, and that only the cash paid in settlement will be brought into the farm accounts for the year.

To enable those who wish to supplement the plan before recommended, some forms of account are added by which the results of the farm in the different branches of live stock and crops may be seen. These forms, it must be understood, are quite independent of the monetary accounts of the profit and loss account, and of the balance-sheets, which are complete without them. The registers, as they may be called, give in detail the profit and loss upon each crop or each lot of live stock, as the case may be, subject to the share of general expense.

PROFIT AND LOSS ACCOUNT FOR THE YEAR ENDING .

	£	s.	d.	£	s.	d.		£	s.	d.	£	s.	d.
To Valuations at 1st January.							By Receipts, as under—						
Payments as under—							Crops—Sales of produce						
Crops—Cultivation, threshing, and cartage							Live stock sold						
Live Stock—Purchase, feeding, and care							Dairy and poultry sales						
Dairy and Poultry—Purchase, feeding, and care							Debts owing to me						
Implements—Cost of new machinery and tools							Income from other sources than above						
Debts owing by me on 31st December													
Expenditure for the year													
Balance being profit and loss, carried to balance-sheet							Balance being profit or loss to balance-sheet						

N.B.—The balance would appear on the Dr. or Cr. side, according to whether the receipts or expenditure were the greater.

CAPITAL ACCOUNT.

Amount of capital as per last balance ... ... £

Deduct—

Household expenses (see analysis of cash account) ...

Loss (if any) from profit and loss account ... ...

Add profit (if any) from profit and loss account ... £

Capital at this date ... ... £

SUGGESTED REGISTER OF LIVE STOCK.

Date of Purchase or Birth.	Number.	Description.	Of whom Bought or how Bred.	Price Paid per Head.			First Cost.			What fed on.	Cost per Week for Feed.			Number of Weeks.	Cost of Feeding.			Wages.			Total Cost.			Sold.					Profit or Loss.*		
																								Date.	No.	Amount.					
				£	s.	d.	£	s.	d.		£	s.	d.		£	s.	d.	£	s.	d.	£	s.	d.			£	s.	d.	£	s.	d.

* It is suggested that for profit a different coloured ink be used to that denominating loss.

SUGGESTED REGISTER OF CROPS.

Name of Paddock.	Area under Crop.	Where Stored.	Quantity Reaped.				How Disposed of.													Cost of Raising Crop at per Acre.			Profit or Loss.*
							To whom Sold or how used.	Date.	Quantity.				Price.	Value.									
														Used.			Sold.	Total.					
	Acres.		T.	c.	qr.	lb.			T.	c.	qr.	lb.		£	s.	d.				£	s.	d.	

* It is suggested that different coloured inks be used for this column, profit or loss.

Bush Work.

By A. J. BOYD.

PALINGS.

GOOD palings of even thickness and of fair width are always saleable in a country where everyone who builds a cottage on his sixteen-perch allotment encloses the land with a close paling fence. Speaking of a fair width, some have an idea that a very wide shingle or paling is an advantage. So far from being an advantage, it is a positive disadvantage to both splitter and consumer. A thin shingle, 8 or 10 inches wide, if put into a roof with a single nail, is sure to curl up at the sides and destroy the regularity of the work, besides which, as it does not lie flat on the roof, it leaves an opening for wind and rain. If two nails are used, the time and expense involved are not compensated for by the extra width. The sawmillers know this, and rarely produce a sawn shingle wider than 4 inches. It is the same with palings. A very wide paling, unless it is of great thickness, will curl in the sun and draw the nail, unless hoop iron has been used as an additional security. When that precaution has not been taken, the paling falls and leaves a convenient gap for the nocturnal predatory incursions of the ubiquitous goat, the musical Thomas puss, or, in the bush, the vagabond wallaby and paddymelon. But this is all by the way, and merely serves to emphasise the advice not to split either your palings or shingles too wide.

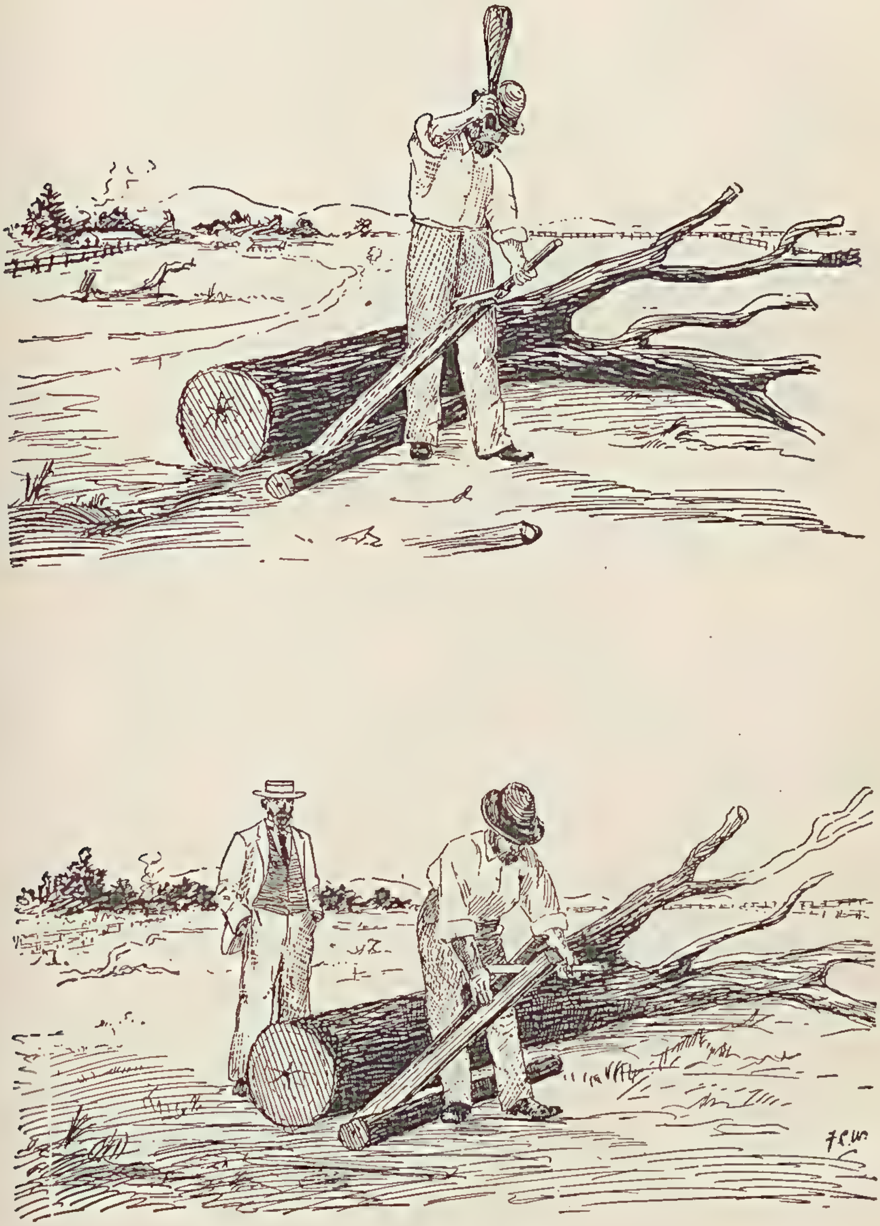
Now, let us suppose that we have an order for a couple of thousand sound ironbark palings. The first thing to do is to select our tree, and the best for the purpose will be one with a small pipe, thus avoiding waste as much as possible. A straight running but "wavy" grain is the best if can be got, as the palings run from such a tree will run very evenly of the same thickness throughout. That thickness should be from $\frac{1}{3}$ to $\frac{1}{2}$ inch, unless specially thick ones are required.

I need not repeat the instructions given for felling, cross-cutting, and busting into billets. That has all been given in the two previous articles. For running out palings no "horse" is required, as must be obvious from the length of the billet. Instead of this, lay a log or a billet on the ground parallel with the unused part of the trunk of the tree, at such a distance from it as to admit of a billet being inserted after the fashion of a lever on a fulcrum. The further from the tree the log is placed, the less will be the height of the end of the billet, so that the splitter can always accommodate his work to his own height. The billet being in position, the next thing is to use the tools in the manner best adapted to easy and speedy work. The position of the splitter is shown in Fig. I. Every man has his own idea of the most comfortable position for working, but, whatever position is adopted, the billet must rest firmly, otherwise any stiff wrench will throw it from side to side, power is lost, and also the splitter's temper. I watched a young fellow trying to split some palings at Pimpama last year. He had the proper tools, but had never seen the work done. He had his billet on the ground, and entered his "throw." Then he had a picnic. The billet dragged him all over the place; and when after an immense amount of unnecessary labour he got his paling off, it was $\frac{1}{2}$-inch thick at one end and 3 inches at the other, and he had to carry the rest of the billet back to its starting point.

"How many do you think I ought to get in a day ?" he asked.

"Well," I said, "you *ought* to get about 400—you *will* get about 40."

Plate LXXXVIII.



SPLITTING PALINGS.

In the evening he told me he had run out 47. Next day I showed him how to go to work properly, and the result was over 200 by teatime. After that he did still better. As with shingles, so with palings. They may be run off on the halving principle or singly. I once had a fancy for stringy-bark palings, so I dropped a fine big stringy-bark tree near my house, and worked at it from daylight to dark. It was a splendid running tree, and I took off the palings one by one, and rarely spoilt one. All were beautifully straight and thin. It was almost as quick as getting shingles, and they made a beautiful fence. Once the billets were split, there was really no hard work about it; but it was hard to get the neighbours to believe the quantity I turned out in a long day. I shall not state here how many I averaged daily; I should be set down as a second de Rougemont.

STAVES.

Staves are usually got from the silky oak (*Grevillea robusta*). No adequate idea can be formed of the silky oak by looking at the specimens growing round about the city on the poor shaly soil of most of our gardens. Even in the Botanic Gardens the specimens are gnarled and knotted, and would be quite useless for the splitter's purpose. But in the dense scrubs they present a good, clean trunk, devoid of knots and branches for many feet. Unlike the hard woods, they are generally easy to burst. Staves, of course, are of varying lengths—there is no rule as to that. The cooper states what length he wants. But they must be of good thickness to allow for a liberal use of the spokeshave or dressing-knife. Two inches is a fair average thickness. They are not *run* out like rails, palings, &c., but are taken the *bursting* way. The reason for this is that, when a cask is made, the bilge will not flake off, as it would do if they were split with the grain. There is a tough timber in our scrubs called "hickory," but it is not at all like the American hickory. A cooper in Brisbane many years ago asked me to get him 200 hickory staves. The order was completed, and I subsequently saw several good-looking hogsheads made from these staves. No further order, however, was given for hickory staves. Some two years later I had occasion to buy several casks for molasses. The casks duly arrived. When they were filled it was found that the staves peeled off, and the casks looked ragged and broken. They were the identical casks made from my hickory staves. No wonder that cooper did not want to make any more experiments.

SPOKES.

There is little to be said about splitting spokes. They are burst off in the same way as staves, but they may also be run out. A mate of mine in Victoria got an order for spokes, and we cruised about the bush looking for a suitable tree. We found a magnificent ironbark which promised to be hollow, so we dropped the tree, and found it to be so hollow that there were only about 7 or 8 inches of solid wood clear of sap. It was a great windfall. We simply placed the blocks on end, and with a single wedge burst off spoke after spoke; when we had worked up the whole tree, which was about 50 feet from the ground to the first limb, we ran the sap and heart off each, leaving a lot of neat spokes from 4 to 5 inches square. Such luck, however, does not always happen.

MORTICING.

For cutting the oblong holes in posts for the reception of rails, an instrument called a morticing axe is used. This is a narrow implement about 15 inches long and 1½ inches broad, with a stout eye into which is fixed a short, straight handle. The post to be morticed is laid across two logs, or on a heap of other posts. The work is begun by cutting out a piece transversely at one end of the proposed hole, 2 inches wide and about 6 inches from the top of the post. A similar piece is taken out at the other end of the hole, 4 or 5 inches from the first cut. Now, if the axe is driven straight into the post

longitudinally between these two cuts, the chances are that the head of the post will split, and then, of course, it is ruined, but by slanting the axe, and cutting first one edge and then the other, the intervening portion of wood flies out, and the end cuts can be deepened and the process repeated. The holes should never be driven right through from one side, although many do so. It is better to make half the hole on one side, then turn the post over and cut through from the fresh side. By this means you avoid splitting your post, and, further, the hole is neater, as a little trimming of the two ends of the hole is all that is required. When the posts are green (and they should always be morticed when in that state), a good workman will make over 100 holes a day. The price paid in my time for the work was 1d. per hole. They were all three-rail fences thirty-five years ago, and a man could earn more than if he had only two holes to make in each post, because there was not so much shifting of timber when the holes were made. I remember, when I was at bush work, an argument being raised as to the number of three-rail posts a man could mortice in a day. It was stated that no man could earn 10s. a day at the work. I maintained that he could if the posts were of bloodwood and quite green. The upshot was that "the other man" agreed to pay me 10s. if I could get through 120 holes in a day, making the day as long as I liked. Next morning we felled a bloodwood-tree and got 100 posts out of it. As I helped at the splitting, it may be imagined that my posts were as thin as was allowable. On the following morning I started work at daybreak. I had fourteen hours before me, and I bored my way through forty-seven of those three-rail posts before it was quite dark.

The morticing axe, if used for many hours continuously, is apt to jar the arm, owing to the straight, rigid handle and the long blade giving a shock at each blow, and on the following day my right arm was very much swollen. Of course a man would not work in such a fashion day after day.

FENCING.

We have now gone through all the processes necessary to enable us to begin fencing. The first thing to do now is to haul our stuff on to the line to be fenced. The posts are laid down at intervals of 9 feet, and with each post two or three rails, as the case may be. They are laid a little off the line, so as not to interfere with digging the post-holes. Having laid down the fencing stuff, we start by putting in a stout round corner post, 1 foot or more in diameter. This post is morticed to correspond with the holes in the posts. The only difference is that the holes are not so wide, as only one rail is fitted into each, whilst the ends of two rails lie side by side in the other post-holes. The corner post is rammed solidly as soon as it is in correct position.

Although one man can erect a fence, it is better and makes easier work if two are employed, one digging the holes, whilst the other dresses the rails and fits them into the posts.

The post-hole digger measures his distance from hole to hole either by a rail, or, better still, with a 9-foot sapling. Whilst he is sinking the hole, which should be 2 feet deep, 2 feet long, 15 inches wide, his mate dresses each end of the rails with an adze. He then saws into it some 6 inches from the end to make the rail fit the hole and to form a shoulder butting against the post. Placing the rails in the holes of the last post, he drops the next post into the hole prepared for it, and his mate helps him to set the other ends into it. Looking over the top of the post, he sees that it is in line with the rest, and then with the maul drives the rail home till the shoulder is firm against the post. Keeping the last one upright, he rams it firmly *at the bottom*—"an inch at the bottom is worth a foot at the top" is a fencer's motto. Then he gradually fills the hole, ramming as he goes, and when finished he starts at the next set. Should any of the rails prove "windy," a fit can be made by dressing the top side of one end rather thin and the bottom side of the opposite end. This has the effect of bringing the two ends more into line. A wrench with the morticing axe

in the post-hole will generally allow the rail to squeeze into its place. In a three-rail fence, the widest rail should be placed in the centre and the lightest on top, to avoid top heaviness. Two-rail fences require both rails to be of the same width. The old three-rail fence has almost completely gone out of fashion.

Instances have occurred of post-holes being sunk with the "crosscut saw." That means that unscrupulous contractors, to save trouble when they come to a rocky bottom before the hole is sunk to the required depth, coolly cut off 4 or 6 inches from the foot of the post. Of course, to look at, the fence is faithfully erected, but the tell-tale ends left about carelessly have often led to a diminution of the contract price.

In my description of timber-getting in my first article, I omitted to bring in the method of—

HAULING LOGS OUT OF A SCRUB.

This is always done by the help of bullocks, and the logs are either "snigged" out or loaded on to a rough, strong trolly. The latter plan is mostly adopted in forest country.

The log having been cut off and barked, the next thing to do is to cut a track through the scrub for the bullocks.

In a heavily-timbered scrub—that is, in one containing so much pine, cedar, and beech that the timber-getter may look forward to years of work—a main track of considerable width was cut often for two or three miles through the scrub to the water's edge, where the timber was to be loaded on to punts. Then a track was cut to each tree felled. Some scrubs are traversed in all directions by these tracks. In others they have grown up again as densely as before, the timber-getters having departed from the district after denuding the scrubs of all saleable timber. As soon as the track is cleared, the bullock-driver brings along his team of four, six, or eight bullocks, according to the size of the log and the nature of the country. A chain is passed round one end, and the log is dragged along the track down to the water's edge, ready for loading or rafting.

In clear forest land, a timber trolly is used. This consists of a strong framework and pole, mounted on low, solid, wooden wheels, tyred with iron. This trolly is placed alongside the log to be shifted, the wheel nearest the log being sunk in a hole dug for the purpose. A chain is passed from the trolly underneath the log, and is brought over the top. A team of bullocks is hitched to the end of the chain, and the log is parbuckled up a couple of skids on to the bed of the trolly, where it is made fast. The bullocks are then yoked to the pole, and the log is conveyed to its destination.

CLEARING LAND WITHOUT GRUBBING.

The destruction of forest timber by means other than grubbing the trees out has, for many years, been an object for research by experimentalists, and various recipes have been given as infallible, but there has always been a flaw somewhere, and the discovery has come to nought. There is, however, one method of getting rid of heavy timber, which has proved successful, although very slow, and consequently can only be adopted where the necessity does not exist for speedy work. Some dozen acres at Woody Point have been cleared of very large trees, some white gums especially having a diameter of from 6 to 7 feet. The land was heavily timbered, and yet was cleared at a cost of about 26s. per acre. The owner, who is fond of making experiments in this line, found in an American paper a process of destroying growing trees, and determined to try it on his land. With an inch auger he bored deep holes in the trees and filled them with powdered saltpetre. He then plugged up the holes, and on examining them some weeks afterwards he found that the salt had been entirely absorbed. He replenished the holes two or three times and waited then to see the trees wither. Instead of this, to his great regret, he

found that they had increased in density and beauty of foliage. The salt seemed to have given them new life, as it was carried with the circulating sap from roots to leaves. Evidently something was wrong. After a time, he met a Canadian gentleman to whom he casually mentioned his experiment, and expressed his opinion that he could not have read the recipe correctly. The Canadian, however, told him that he was quite right. Saltpetre was the only ingredient used, and thousands of acres were cleared by its help in Canada. What had to be done, however, after the salt had been carried through the trees was to ringbark them, and when they were dead to fire them. The Woody Point man set to work and carried out the ringbarking. When the trees were quite dead he set them on fire, with the result that the trees burnt completely out, even to the farthest tips of the roots. Before all were burnt out heavy rains came on and swamped the stumpholes, putting out the fires, but the experiment was a decided success.

He next determined to try the dead logs. Here he failed until he discovered that by mixing two parts of strong saltpetre brine with one part of kerosene, he could saturate the dead timber. When that was done, he waited for a dry hot wind, and then set the paddock on fire. The logs and stumps took fire and burned completely out. The whole cost of the business amounted, as stated, to about 26s. per acre.

With the smaller timber he took another plan. The saplings were cut down, and a large square wedge was driven into the top of the stumps, splitting them into several pieces. When these were dry they were fired, and the result has been that no aftergrowth has made its appearance anywhere. The paddock is perfectly cleared, whilst neighbouring paddocks where the timber had been felled and burned off are covered with a dense undergrowth of young gums, wattles, honeysuckle, &c.

Another method of clearing land of dead standing timber is not new, but it is very seldom adopted. This is simplicity itself. Where the trees have been long dead, all that is necessary is to clear out a little soil to bare the roots. Then after building a fire all round the base of the tree the fire is covered with sods after the fashion of a charcoal pit, and the timber is gradually converted into charcoal and falls, the stump being acted upon in the same manner. This plan is at the present moment being adopted by a contractor for clearing a paddock of standing dead timber at the Queensland Agricultural College at Gatton, and is quite successful.

Dairying.

THE RIPENING OF CHEESE.

NOTWITHSTANDING the skill of the cheese-maker in preparing his milk and the after treatment and manipulation of the curd, he should observe and know, both practically and in theory, the most advisable methods of ripening his cheese if he is to succeed in placing on the market a really good article of its kind.

The want of quality in a cheese may, of course, be due to the use of inferior milk or to lack of knowledge and skill in the making. But supposing that in both these particulars things are as they should be, many a good cheese may be spoiled by injudicious treatment or careless management during the after period of ripening.

CHEESE ROOMS.

If it is desired, as should be the case, to produce the best results with the minimum of extra trouble, a cheese-ripening room specially constructed will go a long way to this end. The room must be so arranged or managed that damp, cold, and excessive heat are excluded, thoroughly well ventilated so that the temperature can be controlled and kept within certain limits. The floor, and any shelves or stands which may be fitted up, should be of some hard close-lying wood. Artificial means of raising the temperature of the room, which are fitted up in most—one might say all—dairies of modern construction, are preferably hot-water pipes, the actual means of heating, *i.e.*, the stove, being outside the room. Cellars or underground rooms, if properly built, are much easier kept under control as regards the regulation of temperature, which we shall presently see is one of the important factors governing the ripening of cheese.

THE PROCESS OF CHANGE.

Various physical and chemical changes take place before the green curd becomes a mature cheese, and although the composition of the cheese depends to a very great extent on the cheese-making properties of the milk from which it is manufactured, yet all the different kinds of cheese made from whole milk start at the same thing, and their special characters owe their development mainly to the after treatment during the ripening period.

The ripening process is really one of gradual decay, in which the constituents of the cheese alter their nature by the action upon them of certain organisms, classed under the names of "moulds" and "bacteria," and also to the unorganised ferments produced by the latter, and termed "enzymes."

The nitrogenous constituents of curd are gradually transformed into a soluble condition, becoming more mellow, and melting as ripening proceeds; the reason why fresh cheese is so solid and unpalatable is because the casein of the curd is insoluble.

In some cheeses the "butter-fat" begins to decay, giving rise to certain fatty acids, &c., which serve to play their part in the ultimate nature of the cheese; but in many cases, where, as the cheese ripens, fat seems to be produced, really it has only accumulated owing to loss of casein (by solubility), water, &c. A certain amount of fat is usually lost, but not from chemical causes or reactions. This point will be considered later on.

Milk sugar, which is present in fresh cheese in small quantities, is not found in ripened cheese; it has been decomposed into such bodies as lactic acid, and possibly butyric acid.

During ripening a certain amount of gas is produced, chiefly carbonic acid gas, and if in excessive quantity a "puffy" cheese is the result. Amongst other products of decomposition, alcohol, carbonate of ammonia, and such fermenting substances as leucin and tyrosin are found. The percentage of water becomes less, and the whole cheese loses in weight. The general process seems to conduct itself in a similar way to that of digestion by the digestive fluids in the stomach and alimentary canal of an animal.

CHANGE IN TEXTURE.

The transformation of the hard elastic curd into a soft buttery cheese is a process which must go on under ordinary conditions; that is to say, the bacteria working this change, having originated in the milk, are enabled to effect this transformation even under the most unfavourable conditions. It is the flavour and mellowness of the cheese which suffers under a bad system of management, for the change in texture is not entirely coincident with the acquirement of a full ripe taste; indeed, the actual texture of a cheese may be all that is desired, and yet a further period of time is necessary for the development of the peculiar flavour.

It is perhaps the pressure to which a cheese is subjected which has the most effect in inducing the close compact texture of a finished cheese, but the curd which will eventually become softened into cheese, simply because, as one might say, it cannot help itself, relies in a great measure on the surrounding conditions for the acquirement of the finishing stroke—quality.

ACTION OF ACIDITY.

It is well known that a cheese in which some considerable amount of lactic acid is present, will ripen in a comparatively shorter time than if there is a deficiency in this respect, and it is so whether the cheese is one which depends for its alteration either on the action of moulds, or bacteria, or as is usually the case, on both.

In early spring it is difficult to get a proper condition of acidity in the curd, and to this is in some part ascribed the dry, flavourless character of many spring-made cheeses.

The fermentation which begins as soon as, or even before, the cheese leaves the press, depends in the first stage on this acidity, and in those cheeses which rely for their ripening on the action and growth of moulds, the whole process is dependent to a much greater extent on the early acquirement of acidity than in the case of cheese of a closer texture.

The great point is to secure the necessary condition of acidity in the milk before renneting, as although the fresher the milk the heavier yield of curd, yet the time of ripening is correspondingly prolonged.

Skim milk intended for the manufacture of cheese requires the development of a greater degree of acidity than with whole milk, as the loss of fat is found in practice to considerably retard the ripening process. It may be as well here to indicate that the following practices tend to further the development of acidity in the curd :—

1. Addition of a "starter" shortly before renneting.
2. Coarse cutting of the curd and prolonging the time between "cutting" and the withdrawal of the whey.
3. Vatting the curd while still heavily charged with whey.
4. Applying a comparatively light pressure in the press.

DEVELOPMENT OF CHEESE MOULDS.

These little organisms, which are classed among the very lowest orders of living plants, originate in cheese by reason of the fact that their spores, or to make the term more expressive we may call them "seeds," are at all times to be found floating in the atmosphere, and naturally find access to all parts of the dairy, when under favourable conditions of warmth, moisture, air, and food supply, coupled with acidity, they develop and grow to an appreciable extent.

The fungus spores becoming entangled in the curd of a cheese, which by its making, condition, and after-treatment favours their growth, develop by producing numbers of minute filaments, which, spreading throughout the interstices of the loosely adhering curd of an unpressed or lightly pressed cheese, give it the appearance of being "blue-veined," and in many varieties both of British and foreign cheeses contribute not a little to the flavour and texture of the same.

During their growth the moulds help to change the character of the cheese in a most noticeable way by reducing both directly and indirectly the amount of acidity present, and it is supposed that when a condition of neutrality exists in the cheese the work of ripening is completed by that other class of low organisms, bacteria. In Brie cheese (a variety of Normandy) a red mould makes its appearance so soon as the excess of acid is consumed by the earlier working fungi. The cheese mould most generally known in the dairy is *Penicillium glaucum*, a blue fungus. There are also, peculiar to certain varieties of cheese, white and red moulds.

BACTERIAL FERMENTATION.

Unlike a mould plant, a bacterium cannot be seen with the naked eye, and because of this a purely practical man feels himself more or less "at sea" in trying to realise that there is existing in his cheese such an invisible controlling power. A bacterium is infinitely small, and, though present in myriads in the products of the dairy and elsewhere, can only be seen by the aid of a powerful microscope. When enlarged in appearance by the agency of such an instrument they are shown as tiny rods and dots, in some cases existing singly, and in others united together in chains and masses. By their life and growth, and the help of certain fermenting substances generated by them (enzymes), they so change the nature of the cheese constituents, in their relation as a whole, as to result in the development of certain characteristics which we recognise as ripeness in a cheese.

Cheese bacteria, instead of gaining access to the curd, are generally supposed to have been present in the milk before renneting, and accompany the curd from cheese-tub to vat. In some varieties of cheese, as before mentioned, they complete and further the work of the fungus organisms, but in most classes of hard-pressed cheese they have the field almost wholly to themselves, and, after the gradual absorption or removal of the excess of lactic acid in the cheese, the work of these bacteria is practically unhindered.

INFLUENCE OF TEMPERATURE.

It is becoming the general custom among our Cheddar makers to produce a quick-ripening cheese, due care being taken in the manufacture to ensure a high-quality cheese, so that a remunerative price and a quick return of the capital invested shall coincide. This is certainly a very business-like way of doing things, and one feels that it is a pity there is not a greater inducement to rely on the later ripening cheese, for even in the show-room the judges seem to favour the former type.

The higher the temperature in the cheese-room the faster will a cheese mature and become fit for market. If, however, the room is kept very warm the cheese is very apt to contract a strong "tasty" flavour, and to be of inferior value in consequence. Cheese ripened at lower temperatures are milder in flavour, and possess an immense superiority in the fact that they keep at their highest market value for a much longer time than the quickly ripened article. As a safe limit never, if it can be helped, allow the temperature of the cheese-room to rise above 60 degrees Fahr., and if you think it to your best interests to make a quick-ripening cheese, depend more on your process of manufacture to attain this end rather than to a high temperature in the cheese-room.

It may be as well to notice that in the event of the cheese-room containing two chambers, one of which is warmer than the other (which might easily be the case when artificial means of raising the temperature are resorted to), the cheese new from the press should be placed in the warmer compartment for the first few days until the "jacket" or rind is fairly formed; then transferred to the cooler room, and eventually brought back to the first chamber to "finish off."

It is hardly necessary to name a minimum temperature for the cheese-room, as it is very unlikely to be too low. Cheese cured at a temperature as low as 45 degrees Fahr. to 50 degrees Fahr. ripen in the end quite as completely as cheese cured at higher temperatures; but the main point to be considered next to keeping below the maximum limit is to keep the temperature as steady as possible. A fluctuation limit of 10 degrees Fahr. is all that is to be desired, and a safe limit into the bargain.—*Agricultural Gazette.*

The Orchard.

STRAWBERRY CULTIVATION.

The season for planting strawberries is now close at hand, and, notwithstanding that full directions for the culture of this delicious fruit have been given in previous numbers of the *Journal*, we make the following suggestions for the benefit of those who have not been recipients of the *Journal* until lately :—

An important factor in successful strawberry culture is the variety which should be planted. Of the following four, either or all may be chosen :—Marguerite, Empress Eugenie, Trollope's Victory, Pink's Prolific, and Hautbois.

Of these, the Marguerite is the largest, the Empress Eugenie coming next. Trollope's Victory, Pink's Prolific, and Hautbois are very fine flavoured fruit, and all are adapted to the Southern climate, especially on the North Coast line and at Buderim Mountain, where they grow to a large size.

First-year-old suckers are the best plants to put out.

Plant in rows 18 inches apart, with 9 inches distance between the plants.

Do not plant on hills, as the plant roots do not obtain sufficient moisture; therefore plant on the level.

They do best planted on sandy loam, and should be mulched at the time of planting, or, better still, lay down a mulch of short stable manure before planting. It is easy to put in the plants by slightly moving the straw and making the hole beneath it.

If possible, the plants should be irrigated at intervals.

In preparing the ground it should be ploughed to a depth of 12 inches.

IMPORTED FRUIT TREES.

We have received the following letter from Mr. John Williams, of Broadwater, writing on behalf of the Queensland Nurserymen's Association, on the important subject of the importation of fruit trees from the south. It must be understood that in publishing this letter we do not establish a precedent opening the door to controversial correspondence. We give it solely because it affords us an opportunity of showing that the Department of Agriculture is quite in accord with the writer's views as expressed by the Queensland Nurserymen's Association, as will be seen from the extracts given from the *Queensland Agricultural Journal*, and from Mr. A. H. Benson's remarks which follow :—

To the Editor of the *Queensland Agricultural Journal.*

Sir,—At a meeting of the Nurserymen's Association held in Brisbane on 13th January, 1899, it was decided that I should write to call your attention to the vast quantities of trees annually imported from the southern colonies that are wholly unadapted to the Queensland climate. A gentleman from Gladstone called on me recently, and said that some three years ago he bought upwards of £30 worth from a southern firm, and now he finds, after three years' labour, loss of sweat, money, &c., he has to dig them up, as his peaches, plums, and other fruit trees purchased, are of no use whatever, being unproductive.

The Department of Agriculture, under "*The Diseases in Plants Act of* 1896," has all invoices of fruit trees imported passing through its hands, and, after last season's importations, cannot be ignorant of the fact that thousands of these trees will be of no use, but worry and vexation to the owners.

The first duty of the Department of Agriculture should be, seeing that we have Mr. Benson, an expert, to tell the people what trees are suitable, and then to teach them how to grow the fruit.

I think, Mr. Editor, much good would result by your giving a list of the different kinds suitable to our colony, and the localities they are adapted for. It will be far better than any picture illustrations, which can now be put into catalogues, that catch the eye and fix the order. Who would buy a horse from a picture? Yet how many will buy a "fruit tree"? But a list as suggested will be advice worth following.

On behalf of the Queensland Nurserymen's Association,

I remain, &c.,

JOHN WILLIAMS,

The Nursery, Broadwater, Mount Gravatt.

Mr. Williams, in the above letter, states that "the first duty of the Department of Agriculture should be, seeing that we have Mr. Benson, an expert, to tell the people what trees are suitable." The following extracts from Departmental records show that the Department of Agriculture has been following the lines suggested by the Queensland Nurserymen's Association, and it is gratifying to know that the Department has the approval of the Nurserymen's Association for their action respecting this very important matter—viz., the importation and dissemination of unsuitable fruit trees in this colony:—

On 10th May, 1897, in a paper on "A Few Notes on Fruits to Grow," read before the Queensland Fruit Growers' Association and widely published by the Press, the expert gave the following advice:—"Don't plant trees that have been raised in the southern colonies of varieties that are suitable to the southern colonies, but which are totally unsuitable for tropical and semi-tropical Queensland." In the same paper a list of suitable fruits was given.

In the Annual Report of the Department of Agriculture for 1897-1898, the Instructor in Fruit Culture states:—"One great fault has been made throughout the length and breadth of the colony, and still continues to be made despite all that one can say or write respecting it, and that is—that growers have planted trees in unsuitable soils and in unsuitable positions, and not only this, but they have planted and still continue to plant large numbers of trees that are absolutely unsuitable to the climatic conditions of the district in which they are attempted to be grown. Such injudicious planting in the past has resulted in much loss and many failures, and the trees, where not actually dead, are generally so diseased as to be a source of danger to any other trees growing in their vicinity."

This statement is followed by a list of the fruits which are recommended as the most suitable for Queensland and of the districts to which individual fruits are best adapted.

In the *Queensland Agricultural Journal* for 1st July, 1898, under the heading of "Orchard Notes for July," the following advice appears:—

"Don't plant rubbish, and only plant those trees that your soil and climate are adapted for. Remember that the climatic conditions of this colony, with the exception of the Stanthorpe district, are altogether different to that of the colder parts of the southern colonies, and that therefore we cannot grow the same fruits here in our tropical and semi-tropical districts that are grown successfully in the south. I wish to call the attention of all fruitgrowers to this very important matter, as during the past few weeks several thousand fruit trees have been imported into Queensland from the southern colonies, many of which are quite unsuitable to the districts to which they have been sent, and the planting of which will only cause disappointment and loss to those persons who have purchased them. The trees themselves are good, and provided

that they were grown in a suitable climate would produce good fruit, but they are quite unsuitable for the greater portion of this colony. I especially wish to warn fruitgrowers and intending fruitgrowers not to plant varieties that are unsuited to the climate, and advise all such to consult the Department of Agriculture as to the suitability or otherwise of the fruits they wish to plant, as I am certain that they will find it to their advantage to do so.

"It costs just as much to prepare the land for and to plant, prune, and look after an inferior variety or a variety of fruit that is unsuitable to the climate, and from which no return of any value will ever be obtained, as it does to grow a variety that is suitable to the climate and that will produce superior fruit that will meet with a ready sale; therefore, no fruitgrower can afford to spend time and money growing unsuitable varieties, and the sooner that this is realised the better for the fruit-growing industry of this colony."

The following warning also appeared in the Brisbane Press of 24th January, 1899:—

"VALUELESS CITRUS PLANTS.

"Under the Diseases in Plants Act, all plants and trees imported to the colony from the south are forwarded to the Department of Agriculture for the purpose of inspection and fumigation. On a recent occasion a number of young citrus plants were received in this way; but when examined by Mr. Benson, fruit expert, it was found that the citrus plants were young lemon stocks that had been grafted. All the grafts, however, were dead, and a number of young lemon shoots were growing in their places. These plants were absolutely valueless, and Mr. Benson has therefore advised that their introduction into this colony should be prohibited, as when sold to persons who have no knowledge of fruit trees they are bound to turn out a loss and a disappointment. It appears also to be a common practice for orange grafts to be placed on lemon stocks; these grafts often die, and then the original stocks shoot out. It is only some considerable time after that the persons who receive them find out their mistake. The Department of Agriculture have therefore concluded that a warning note should be sounded in this respect."

The Department of Agriculture advise all fruitgrowers and intending fruitgrowers to pay careful attention to the warnings issued by the Department. They also advise any fruit-grower who is uncertain what to plant to consult them, instead of taking the advice of travelling agents armed with finely illustrated catalogues of fruit, whose sole object it is to sell as many fruit trees as possible at the highest rate, quite irrespective of the suitability of the trees to the district in which they are sold. A very large proportion of the fruit trees sold by the travelling agents of southern nurseries is totally unsuitable to the warmer parts of the colony, and the planting of such can only end in disappointment and loss.

FRUIT INSPECTION.

By DANIEL JONES,
Fruit Inspector.

The attention paid to horticultural pursuits in Australasia during the past year or two has in no respect been more pronounced than in the regulations and legislative enactments put in force by all the colonies in view of repressing the baneful effects of insect pests that play such havoc with the horticulturists' interests. Each of the colonies, in its legislative wisdom, has framed laws more or less stringent with a view to safeguarding fruit-growing from the evils of the unrestricted introduction of certain forms of insect life that sap the foundation of the prosperity of the unfortunate fruit-grower—at all times

perilously subject to invasion from these sources. On the part of the trading and consuming public, some considerable ambiguity exists with regard to the operation and intention of the Diseases in Plants Act of Queensland. The enforcement of the regulations in the detention of imported fruits, resulting in some cases in their destruction or reshipment, is often cited as an act of retaliation for similar treatment meted out to our fruits elsewhere. Having considerable experience of the methods of inspection adopted in our own and in the sister colonies, I wish to emphasise, as far as my observation goes, allowing for a greater stringency in dealing with diseases not yet established in the country, the fact that the inspection of fruit is carried out solely with the view of protecting the fruit-growers concerned. No doubt at the inception of the system of fruit inspection some of the colonies, with an ardour born of excessive zeal, were too strict in their attention to duty; hence some wrongs may have been inflicted on traders and growers alike.

Now, however, as the result of experience and wiser counsels, anomalies such as were formerly frequent are exceptional. It can never be expected that, in following out the course of action laid down by legal statute or by departmental regulation, the inspector's action can be always in accordance with rigid rules, for such practice would tend to materially interfere with the trading facilities of agents and growers alike. Hence, as a natural sequence, that useful and undefined quality of expediency must come in, without which few Acts of Parliament could be administered satisfactorily.

It is but reasonable that the traders, growers, and the consuming public should be put in possession of the results of our efforts to protect the diverse interests concerned. The most antagonistic trader will voluntarily admit that, as far as Queensland imports are concerned, the standard quality of fruit has been much improved owing to the restrictions imposed; and although the different classes of fruit are not by any means evenly graded as regards quality, there is now an almost entire absence of that low grade of fruit which was difficult to dispose of, either by the wholesale or retail trader, and exerted an injurious influence on the prices of fruit of a superior grade. There is no doubt that the regulations, although not contemplated to cover this portion of the trade, have done an immense amount of good in all directions. What would our fate be should we at any time revert to the free introduction of fruit, with its disastrous effects on public health, trade, and on horticultural pursuits, by permitting Queensland to become once more the dumping ground for the diseased products of America Asia, Europe, and the neighbouring colonies?

The law as to fruit inspection, then, has, as its prime motive, the protection of our local fruit-growers from further contamination from outside sources, and also, as far as lies in our power, the prevention of the dissemination of diseases through the ordinary channels of trade by the agency of our own producers. For this purpose then we, as far as our very limited staff will permit, inspect and condemn diseased fruits arriving from our Northern ports by sea and from inland by rail. It is sometimes argued, and with some force, that this procedure with regard to local fruits is not consistent with the intentions of the Act; nevertheless, experience has amply justified this course, as no more effective check can be put on a careless grower than to embarrass him in the marketing of diseased fruit when he has the temerity to run the gauntlet of inspection. We thus get at a grower who is difficult to discover, except by the very expensive and slow method of a comprehensive orchard inspection.

The interdiction of fruits that convey such formidable enemies to the orchardist as the San José Scale, which has appeared on imported apples from California, and now is found on some types of apples sent from New South Wales, have been amply justified. Once established, there is scarcely a more insidious pest to combat than this particular scale insect, which has proved so formidable in certain States of America that every new outbreak is the cause of much alarm and energetic legislative action to secure its eradication.

I am sure our New South Wales friends will, in the near future, have bitter cause to regret the attack on their orchards by this scale. Judging by the increase among the apples affected this year, above what was discernible last season, this scale has made considerable headway in the orchards. The growers then have a most unpleasant task before them to restrict the ravages to the districts already affected, and to clean the orchards where this disease is now evidently rampant. Observation has also disclosed the fact that this season nectarines, Japanese plums, and, to a small extent, peaches from New South Wales have been affected with the San José Scale. The appearance of the fruit-fly maggot in the New South Wales peaches is a great source of trouble this season. This pest has, in common with the San José Scale, evidently made considerable headway since last season among the orchards of the sister colony. It has also disclosed itself in the pears from the same place. Black Brand and Red Scale on citrus fruits are frequently found, and evidently the New South Wales growers have not been able to diminish to any extent the ravages of these diseases. Pears are frequently affected as well as apples from the same source with Codlin Moth, the pears being also frequently badly affected even to distortion by Pear Scab. To our mother colony then must be awarded the unenviable distinction of having a plethora of insect pests that menace our horticultural industry by land and water, San José Scale, fruit-fly infested fruit, Codlin Moth, &c., having been frequently interdicted from the New England districts, as well as from Sydney direct, by sea. Victoria, so far, has not been a shipper to this colony to the same extent as New South Wales and Tasmania, and, save for a few examples of Black Spot on pears and Codlin Moth in apples and pears, the sum total of fruit interdicted has not been serious.

Tasmania, at present, is no formidable danger to this colony so far as our observation goes with regard to insect pests; the soft fruits coming in, such as plums, apricots, gooseberries, &c., are usually free from affection. The most troublesome aspect of the trade is the serious attack of the fungus of Black Spot. This, however, is not common to all the species grown there. Apples, such as French Crab, Pearmains, and other varieties, are not nearly so liable to the disease as the Sturmer Pippins, which in some districts are scarcely free from this unsightly fungus growth. I am informed, on the authority of one of our most experienced traders, that, as a sequence of our interdictions during the past season, the growers in affected districts have this season invested largely in modern spraying outfits, and, as a result, we hope to have the pleasure of passing Tasmanian apples in full conformity with regulations to the mutual satisfaction of all concerned. In summing up the results of our fruit inspection, I may now be permitted to portray the useful and practical trend of our operations. I have always emphasised the fact that fruit inspection at ports of entry has a most practical reflex action on the horticultural pursuits of the shipping colony; hence the interdiction of diseased fruits from one colony by the other so militates against the producer that as a measure of self-protection he must do all in his power to minimise the ravages of disease, otherwise he has no outside market for his fruit. Thus foreign interdiction of diseases by reasonable decree means more attention to local disturbances of the trade, and our inspection becomes valued as a necessary evil, which exists "for some good by all not understood." To the researches of scientists we are now indebted for a very great amelioration in the conditions attendant on the destruction of scale insects affecting fruits. The hydro-cyanide treatment of citrus and other fruits by fumigation in a close chamber has resulted in a cheap and effective method of destroying scale insects. We are now insisting that citrus and other fruits on which the presence of scale is discernible must be treated with cyanide fumes before admission. This has already been to a very great extent adopted with regard to Italian lemons, and the fiat has gone forth that New South Wales apples must be so treated when infected with San José Scale. As this method is cheap, simple, and practical, it is now being greatly availed of, and will ultimately, to a very great extent,

solve the problem of efficient fruit inspection so far as scale insects are concerned. Recent observations indicate that the fumigating with cyanide fumes has no material effect on the larvæ of the Codlin Moth or Fruit Fly, instances being disclosed of the grubs being quite alive in the fruit and apparently no worse for their experience in the midst of the cyanide fumes. I am now more than ever confirmed in the opinion that a conscientious, firm system of inspection is the only way of protecting the fruit-growers from the aggression of insect foes. I hold that investigation into the best methods of eradicating pests and care in packing clean fruits will result in eventually rescuing the fruit industry from the precarious position it now occupies, and placing it in the more stable one that its importance as a factor in our colonial enterprise entitles it to.

Viticulture.

CELLAR WORK—RACKING.

By E. H. RAINFORD.

THE first operation connected with new wine after it has completed its fermentation is racking it off the gross lees into clean casks, and this should be done as soon as the wine has cleared, and in some cases before it has cleared. The object of the racking is to separate the wine from the impurities deposited at the bottom of the cask during the fermentation, which contain the elements of future trouble to the wine if this operation is neglected or delayed too long. The lees contain besides the *débris* of the crushed grapes, tartar, dead ferment, &c., a number of living organisms which have been entangled in the settling lees, and are ready to resume their operations if there is a rise of temperature, or any other disturbing influence happens. Should a rise of temperature take place, and fermentation, however slight, start in the cask, the disengagement of carbonic acid gas will carry upwards with it the lighter parts of the lees, and the wine will become more or less cloudy as the fermentation is more or less pronounced. New wine standing on the lees for any length of time is also liable to acquire a disagreeable taste, a result of the decomposition of albuminous matter in them.

To avoid the possibility of the defects mentioned occurring, the wine should be racked into a clean cask as soon as the fermentation has ceased and the wine has cleared. It will sometimes happen that a cask of new wine will continue cloudy or thick after the others have cleared. When this occurs, it should be narrowly watched. If there is reason to believe that the must in that particular cask is richer in sugar than the others, then the fermentation may be allowed to continue its course; but if there is no reason to believe such to be the case, it should be checked at once, as in all probability the cloudiness is caused by bacterial fermentation or the decomposition of substances other than sugar, which will jeopardise the quality and condition of the future wine.

To effect this, rack the cloudy wine into a well-sulphured cask, which should cause the wine to clear, and then rack again as soon as it is bright.

The best time for racking wine is during cool, dry weather; a warm, moist, muggy atmosphere is prejudicial, as it may start a fermentation, and occasionally communicates to light white wines a peculiar "mousey" flavour not easy to get rid of.

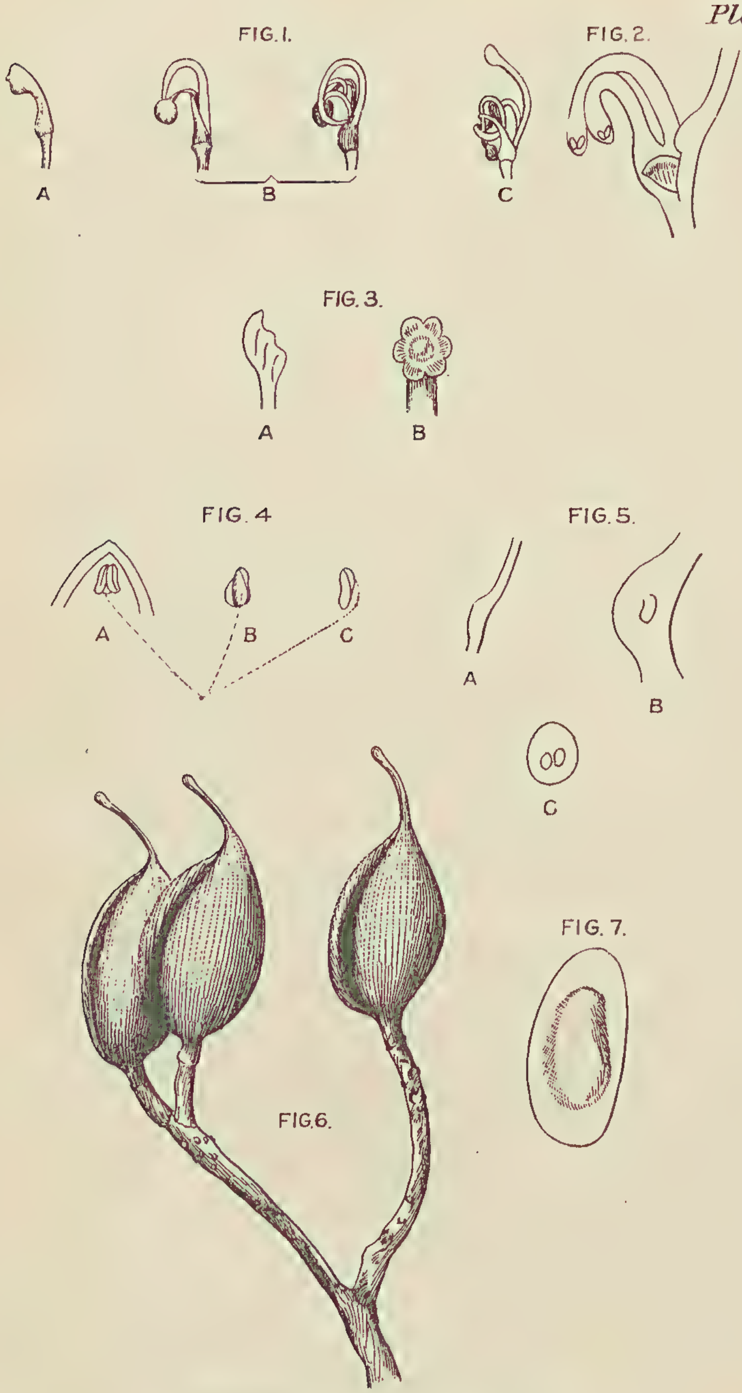
Racking may be effected with the tap syphon or pump. The former is best for strong, fortified wines which require aerification to develop their qualities rapidly; the latter is indicated for light wines, the aerification of which is to be avoided. The syphon is useful, as it does away with the hammering necessary to fix the tap with the possibility of the lees being stirred up by it, but the immersion of the syphon should be carefully regulated so that it shall not reach down to the lees and draw some over, neither be lowered insufficiently and so leave a quantity of clear wine in the cask which will have to be removed with a tap. After racking with a pump, the indiarubber hose should always be laid along the top of the casks in such a way that the moisture shall be able to drain from the centre to the ends, for if there are loops in the piping the moisture will collect there and rot the rubber. Never hang the hose over a nail, or allow any sharp angles in it, as the rubber will soon flatten at that point and begin to fissure.

The casks into which the wine is racked should be well washed out and sulphured, and the sulphuring should take place a few minutes previous to the racking, and in moderation. A very common error is to use far too much sulphur with prejudicial, instead of beneficial, effects on the wine. The object of sulphuring is twofold—firstly, to act as a disinfectant to the cask and wine, as sulphur vapour kills or paralyses bacteria, germs of mould, &c. Secondly, to remove from the wine the oxygen absorbed by it during the racking. The vapour of burning sulphur (sulphurous acid) has a great attraction for oxygen, and if the cask is sulphured some time before the racking the sulphurous acid may become oxygenised before the wine is racked into it, and so be debarred from removing the oxygen from the wine which, in the case of young light-red and white wines, assists acidification. When a cask is oversulphured, the air absorbed by the wine during racking is only sufficient to oxygenise a portion of the sulphurous acid; the remainder is dissolved in the wine, giving it a sulphurous smell until, by absorption of air through the bung or the pores of the wood, or by subsequent rackings, it is got rid of. A ¼-oz. for 100 gallons of wine is sufficient for sound wine, but where fermentation is to be checked a larger quantity must be used. In the case of fortified sweet wine, sulphuring is not necessary—in fact, it does more harm than good, as the wine requires all the oxygen it can get to mature quickly.

A word as to the best way of sulphuring casks. The common method of burning strips of paper or rag daubed with melted sulphur in the cask is crude and unsatisfactory, as much of the burning sulphur drops on the bottom of the cask, which is liable to communicate a taste of bad eggs to the wine, and any ash of the rag or paper, falling inside, might also affect the flavour of a fine wine. The best system of sulphuring is to fix a shallow iron cup to a thick wire, in which the sulphur is lighted before lowering into the cask; the cup must be very shallow or the sulphur will not keep alight, and it must also be small enough to pass through the bunghole. Another way is to prepare matches made by soaking a few yards of broad tape in melted sulphur, which is cut up into six-inch lengths; one or two lighted and placed in a round case of sheet iron pierced with holes to allow access of air and lowered into the cask will prevent dripping of burning sulphur.

Rack, as a rule, into casks slightly smaller than those in which the wine was fermented, to allow for loss of bulk by removal of the lees, and be careful to keep the casks well filled up from time to time with *sound* wine of similar character and quality. A second racking should be given in the spring before the hot weather sets in.

Plate XC.



GREVILLEA HELMSIÆ, Bail.

Plate LXXXIX.

GREVILLEA HELMSIÆ, Bail.

Botany.

CONTRIBUTIONS TO THE FLORA OF QUEENSLAND.

By F. MANSON BAILEY, F.L.S.,
Colonial Botanist.

Order PROTEACEÆ.

GREVILLEA, R. Br.

Section Plagiopoda.

G. Helmsiæ, *Bail.* (n. sp.) Plates LXXXIX. and XC. (After Mrs. R. Helms.) A small tree with a somewhat rough bark; branches nearly terete, more or less clothed with a thin grey tomentum, the young growth almost strigose. Leaves narrow-lanceolate or elongate-spathulate, 3 to 7 in. long, seldom exceeding ¾-in. broad, tapering at the base, but scarcely forming a distinct petiole, of a greyish colour; the upper side glossy, silky-hairy when young, minutely punctate, underside pale from a thin scurfiness; primary lateral nerves numerous, erecto-patent, the lowermost ones sometimes looping within the margin; margins entire or sometimes the longer leaves showing a few distant indentations in the upper portion, apex ending in a small dark gland (leaves on adventitious shoots from the trunk longer and narrower than the others). Racemes near the ends of the branchlets, almost sessile, seldom much exceeding 1 in.; flowers very dense, of a spicy fragrance. Pedicels slender, about 3 lines long, silky-hairy as well as the rhachis. Perianth long as the pedicel, silky-hairy outside, the inside with long white hairs, except at the base, where the tube is glabrous; opening to near the base, and very revolute. Gland semi-annular. Ovary on a stipes of about 1 line, which is glabrous, as well as the ovary and style; the latter much curved, about 7 lines long. Stigmatic disk oblique, oval, convex. Fruit ovate-oblong, mucronate from the persistent base of the style, nearly 1 in. long, ½-in. broad, valves woody. Seeds 2, greyish-brown, surrounded by a narrow wing, about 10 lines long, 5 lines broad, including the wing.

Hab.: Childers, *Mrs. R. Helms*, who also furnished drawings from which the plates have been produced.

Explanation of Plates.

LXXXIX.—Flowering branch (nat. size).

XC.—Fig. 1. Flower; (*a*), bud; (*b*), half-open; (*c*), open (all nat. size).

Fig. 2. Longitudinal section of flower (enlarged).

Fig. 3. Stigma; (*a*), side view; (*b*), front view (both enlarged).

Fig. 4. Anther; (*a*), end of segment with anther, dotted lines pointing out connective; (*b*), back view; (*c*), side view (all enlarged).

Fig. 5. Ovary with portion of style; (*a*), side view; (*b*), longitudinal section; (*c*), transverse section (all enlarged).

Fig. 6. Ripe fruit (nat. size).

Fig. 7. Seed (nat. size).

Economic Botany.

JOB'S TEARS (*COIX-LACHRYMA-JOBI*)—A USEFUL FODDER.

By F. MANSON BAILEY, F.L.S.,
Colonial Botanist.

DURING Lord Lamington's tour round New Guinea in May last, at almost all the places visited was seen a luxuriant growth of the grass known as Job's Tears (*Coix Lachryma-Jobi* of the botanist). The growth of the plant and the beauty of its seeds made such an impression on Lord Lamington that he requested me to take seeds of each to Queensland for cultivation, which I did; and the accompanying plate illustrates the product of a single seed sown in my garden at Spring Hill, in by no means favourable soil or situation for fodder-growing.

The plant represented comprised 26 stems from 2 to 4½ feet high, leafy throughout their whole length—in fact, it is a model fodder plant, suiting the climate both North and South of the colony, and from this point of view is now brought to the notice of dairymen and farmers generally.

The present form seems to be of a more succulent character than that generally found in garden culture.

The two kinds met with in New Guinea differed considerably in the form of the seed—the one being tear-shaped, and the other linear or oblong; both are usually of a bluish-grey colour. The stems of each, from a single plant, are numerous and very leafy. So far as I have been able to judge, the long-seeded form is of smaller growth, but my seeds of this were sown later than those of the other. I may remark that I have had specimens of this grass sent to me for determination from different parts of Queensland by persons who have met with it in a naturalised state, but whether these belonged to the New Guinea forms or not I cannot say.

One advantage possessed by this plant over sorghum is that it does not make so strong a root, so that when necessary to plough out to renovate the plantation it will not form so strong a resistance to the work as the varieties of sorghum. The stems are also more slender and not so coarse.

In sowing the seeds, place them about 1 foot apart in rows 2 or 3 feet asunder, during the months of September and October. The plants being perennial they will last for several years without renewing.

The plant may also be increased by divisions of the stool, which allows of vacancies in the plantation being filled up.

The natives of New Guinea seem only to use "Job's Tears" for ornamentation purposes, the pretty bluish-grey seeds being prized for making into necklaces and decorating their weapons, &c. I could not hear of the seeds being used for food by them, yet Sir J. D. Hooker tells us that the plant is cultivated in India for this purpose; therefore in all probability the seed of the two New Guinea forms may be put to the same use in some parts of the island. Duthie states that in Oudh (India) the plant is largely eaten by cattle, and is said to be very fattening.

Plate XCI.

COIX LACHRYMA-JOBI (JOB'S TEARS).

Tropical Industries.

THE EXHAUSTION OF GUTTAPERCHA.

GUTTAPERCHA, caoutchouc, and rubber are usually supposed to be synonymous terms, but this is not so. Guttapercha is derived from a tree whose botanical name is *Isonandra Gutta*, and also from another tree, *Dichopsis Gutta.* These trees grow wild in the Malay Peninsula. To obtain the sap, the trees are first felled with axes, because the usual method of collecting rubber by simple incisions in the bark is insufficient in the case of the guttapercha-tree. After felling, incisions are made in the bark at distances of from 6 to 18 inches apart, to cause the flow of the milk or sap, which, as it flows from the incisions, is caught in palm leaves, cocoa-nut shells, and other primitive vessels, but more or less escapes to the ground, and this is gathered up along with sand and other particles of foreign matter. In some instances, when small quantities are collected, the milk is inspissated or concreted by being rubbed between the hands. As a general rule, however, it is boiled in iron pans with the addition of various adulterants. Among their adulterants, other than the juice of allied plants, is cocoanut oil to improve the appearance, and also lime juice, which has the property of coagulating the guttapercha immediately on ebullition. In Borneo, some 20 per cent. of scraped bark is added, and it is said that the Chinese, who purchase the article from the gatherers, prefer it when containing this bark, on account of the red colour it imparts. The purely crude guttapercha is the article in the fluid state as it flows from the tree. It being, however, impracticable to preserve and market it in this condition, it is prepared and manipulated in the manner above stated for the purposes of transportation and market.

Caoutchouc is the product of many trees and vines growing in different parts of the tropical world, all of the *Ficus* family. The richest caoutchouc or rubber-producing zone is on the banks of the southern tributaries of the Amazon, in Brazil, on the island in the main stream, and near Para. This area contains at least 1,000,000 square miles, on which grows an inexhaustible supply of the *Hevea Braziliensis*, a rubber-producing tree which grows much like an English ash, and attains a height of 60 feet. It thrives in low, swampy country, requires the shade of other trees and still air, and takes fifteen years to mature. It is being continually reproduced by nature, and an exhausted area, when left alone for some time, will recover. A hundred Para rubber-trees will yield as much as 1 ton of rubber per annum. The trees are not cut down as in the case of the *Isonandra Gutta*, but are tapped as they stand, and hence are not destroyed.

The *Castilloa elastica*, whence large supplies are obtained, ranges from Mexico, through Central America into northern South America. Unlike the *Hevea* of the Amazon, it does well in dry, healthy ground, where a man from the temperate regions of the earth can expect to live and see his trees develop. It reproduces itself in suitable localities, but it is essentially a tree of the shade, like our huge scrub Moreton Bay figs (also rubber-producers). Destroy the scrub, and the tree, being exposed to the fierce rays of the sun, immediately begins to thicken its naturally tender, thin bark at the expense of the flow of sap. Hence, in many cases, where thousands have been expended on establishing plantations of the *Castilloa* trees, the result has been total loss. On the other hand, a careful selection of a run of forest property, where rubber-trees reproduce themselves naturally, must yield returns that will exceed the most sanguine expectations.

The supply of rubber, then, may be looked upon as inexhaustible, and prices, although they may fluctuate somewhat, will probably hold at the present quotations, which are:—For Para, of various grades, from 63 to 93 cents (2s. 7d. to 3s. 10d.) per lb.; for African, 60 cents (2s. 6d.); for Assam, 80 cents (3s. 4d.); for Borneo, 40 cents (1s. 8d.); whilst for guttapercha the price is 1 dollar 50 cents (6s. 3d.); for medium, 1 dollar 30 cents (5s. 5d.); and for lower sorts, 50 cents (2s. 1d.).

These prices are given to show how much more valuable is guttapercha than caoutchouc, or what is usually known as rubber.

On this subject the *Engineer* sounds a note of warning as to what must be the result of the exhaustion of guttapercha in connection with the international network of submarine telegraphs, which has become such an important factor in political and commercial activity, that one can scarcely realise the consequences which would result if this system were to be thrown out of gear or destroyed. Nevertheless, if we are to believe certain prophets, whose pessimistic views are only too strongly supported by evidence, the world is threatened with the loss of the submarine cables. A writer in the *Revue des Deux Mondes* (M. Lazare Weiller), who is competent to speak on the subject, utters somewhat timidly the first note of alarm. He has been followed by M. Adolph Combanaire, another specialist of higher standing, who has exposed in the *Electricien* the danger that threatens submarine cables. According to this writer, the days of these cables are numbered. In ten years, or perhaps sooner, an irreparable breach will occur in this endless network which runs round the globe, and the electric messages will then be discharged into the depths of the ocean, where they will remain. A mere detail will have sufficed to disorganise the working of the system, and to paralyse the telegraphic intercourse of the world. This detail, which at present seems to trouble nobody, is the exhaustion of guttapercha. This substance has been discovered nearly sixty years. Contrary to ordinary caoutchouc, it has the curious property of becoming soft in boiling water, and is thus capable of being very easily moulded into any shape; then, under the influence of cold, it assumes an extreme hardness. Ever since the first cable was laid between Dover and Calais, on 13th November, 1851, the use of guttapercha has been an absolute necessity. In vain have skilled scientists made experiments with a view of substituting other materials of a similar nature in place of guttapercha. These efforts proved to be fruitless, and the attempt was finally abandoned. The difficulty was further increased by the fact that not every kind of guttapercha was found to be equally useful in protecting submarine cables, and in the end only two kinds, produced exclusively in a district several hundreds of leagues in extent in the neighbourhood of Singapore, were alone made use of. It is only in this region, and nowhere else, that the regularity of the climate, the constancy of an extreme temperature, marvellous humidity, and the volcanic character of the soil, all unite in forming a sort of hothouse, in which the plant can produce abundantly, and in a lasting manner, in its tissues those essential oils on which its properties seem to depend. Other guttas, when once submerged in water, very quickly begin either to exude gutta or to undergo atomic changes, which processes at once render them useless. Although there exist several varieties of trees which produce good gutta, there is, unfortunately, only one method of gathering it; it is a wasteful method, for it consists in cutting down the trees. In fact, contrary to the method adopted in the case of caoutchouc and intermediary gums, simple incisions made in the bark of the percha-tree are not enough. At this rate guttapercha will soon be a thing of the past. When the report got abroad recently that an American cable was to be laid across the Pacific Ocean from San Francisco to Tokyo by way of the Sandwich Islands, and with branches to the Ladrones and Manilla, the price of guttapercha rose in a few days from 40 to 50 per cent. M. Combanaire also says that it would be impossible to find in France at this moment 10 tons weight of matured gutta fit to be used in making a submarine cable. Is there no way of remedying the gravity of the situation? Until a

new substance shall have been discovered capable of taking the place of gutta-percha, there is only one remedy, and that is the formation of nurseries for promoting the growth of the tree on a systematic plan; these trees must be treated as game is treated if they are not to disappear from the face of the earth. There is little doubt that Java, Borneo, and Sumatra would afford a favourable ground for experimenting with the cultivation of this precious tree, whose product has become so highly essential to the continued intercourse between the nations of the world.

MANURING OF TROPICAL PLANTS—RICE.

The two varieties of this plant—viz., water rice and upland rice—require different soils and different climates. The first variety is more generally cultivated, and requires a moist, clay soil, that can stand the necessary watering. Lighter soils should at least have a loamy, impermeable subsoil. Upland rice, on the other hand, can be grown on a soil not quite so rich; it stands dryness much better, and thrives also in less warm climates.

The following quantities of plant-food ingredients are removed from one acre*:—

			Potash.	Phosphoric Acid.	Nitrogen.
By an average crop of	2,676 lb.	grains ...	28·1 lb.	16·3 lb.	26·2 lb.
" "	2,676 "	straw ...			
" "	446 "	chaff ...			
By a good crop of	4,014 "	grains ...	45·7 lb.	24·9 lb.	39·2 lb.
" "	4,460 "	straw ...			
" "	624 "	chaff ...			

Very thorough investigations have been conducted by Prof. Kellner† and others in Japan, as to the fertiliser requirements of water rice. In order to determine the exhaustion of nitrogen, phosphoric acid, and potash in the soil, a fertiliser trial was inaugurated, in which each plot received the following quantities of fertilisers to the acre:—

Plot 1	No fertiliser.		
" 2	89 lb. phosphoric acid	89 lb. potash	— lb. nitrogen
" 3	— " " "	89 " "	89 " "
" 4	89 " " "	— " "	89 " "
" 5	89 " " "	89 " "	89 " "

Nitrogen was applied in the form of sulphate of ammonia, phosphoric acid in the form of double superphosphate, and potash in the form of carbonate. The development of the plants corresponded to that of the previous years; the plants which had received a complete fertiliser grew best of all, showing a normal green colour; next came the plants to which no potash had been applied. The plants to which no nitrogen had been given were of a light-green colour. Phosphoric acid seems to have a very beneficial effect upon the growth of the plant, for the plants which had not received phosphoric acid differed but little from the unfertilised plants; they were of a dark-green colour, but very small. The average yields from three check plots (the size of the plots is unfortunately not given) were as follows‡:—

(Yields given in ounces.)

	Straw.	Full grains.	Empty grains.	Total.
No fertiliser	10·2	7·5	0·1	17·8
Without nitrogen ...	16·8	12·0	0·2	29·0
Without phosphoric acid...	13·1	9·5	0·2	22·8
Without potash	22·2	14·6	0·4	37·2
Complete fertiliser ...	27·5	20·3	0·3	48·1

* Lierke, praktische Düngetafeln, Berlin, Parey.
† Imp. University of Agriculture Komaba, Tokio, Japan, Bull. 11, &c.
‡ "Jahresbericht für Agriculturchemie," 1892, p. 250.

Investigations were also conducted, to determine the quantity of nitrogen available by the rice-plant when green manuring with a legume (*Astragalus lotoides*, Lam.) is resorted to.* Astragalus was sown in the autumn, and fertilised with different quantities of lime. In the beginning of May, when the plant was in full bloom, it was cut, weighed, and then turned under. The yield of green material was as follows:—

Quantity of lime applied per acre	0 lb.	89 lb.	178 lb.	356 lb.
Yield of astragalus per acre ...	8,991 ,,	16,573 ,,	16,341 ,,	13,451 ,,

The conclusion can thus safely be drawn, that astragalus responds well to lime fertilisation, though 89 lb. per acre were sufficient for the soil in question. The leguminous plants analysed 12·23 per cent. dry matter and 0·369 per cent. nitrogen; the plants from the plots fertilised with lime contained 2,266 lb. dry matter and 69 lb. nitrogen per acre. In addition to the green manuring, 98 lb. of phosphoric acid in the form of phosphate of soda and 98 lb. of potash in the form of carbonate were applied. The yields from the separate plots were as follow:—

Fertilisers Applied per Acre.	Yields per Acre in lb. Straw.	Full Grains.	Empty Grains.	Total Yield.
Potash and phosphoric acid without nitrogen	0·478	3·681	0·029	0·849
Potash and phosphoric acid, green manuring without lime ...	0·556	5·141	0·037	0·973
Potash and phosphoric acid, green manuring with 89 lb. lime	0·747	5·653	0·047	1·315
Potash and phosphoric acid, green manuring with 178 lb. lime	0·736	5·497	0·049	1·291
Potash and phosphoric acid, green manuring with 356 lb. lime	0·767	5·761	0·041	1·348
Potash and phosphoric acid, complete fertiliser with 473 lb. sulphate of ammonia	0·870	5·692	0·068	1·446

Green manuring increased the yield considerably, especially on the plots that had received lime. The complete mixture of artificial fertilisers produced just as good yields as the green manuring; as in green manuring the nitrogen in the atmosphere can be utilised, this method is naturally less expensive, and hence more profitable.

A similar experiment with green manuring was conducted with another nitrogen-gatherer—viz., indigo (*Indigofera tinctoria*)—in the botanical garden at Buitenzorg, Java.†

The indigo was grown during the East-monsoon, and as much as possible ploughed under during the rainy season. For the sake of comparison. two fields were manured with 205 and 410 lb. of lime per acre respectively, while a fourth was left unfertilised. The yields were as follow:—

	From 1 Bouw = 1·7 acre.	From 1 acre.
Green manuring	58·4 pikul	4,596 lb.
410 lb. lime	56·0 ,,	4,407 ,,
205 ,, ,, ...	52·8 ,,	4,156 ,,
No fertiliser	48·0 ,,	3,778 ,,

Field experiments on a more extensive scale have been conducted in Italy, the results of which are given in the following table:—

* "Jahresbericht für Agriculturchemie," 1891, p. 172.

† "Verslag omtrent den Staat von 'Slands plantentuin' te Buitenzorg ofer het Jaar 1894, Batavia 1895, page 42.

Fertilising Experiment with Rice.
By Professor Tito Poggi* on the Vendramin Farm (Po Valley).

No. of Plot.	Fertilisers applied per Acre.					Yields per Acre in the 1st year.				Yields per Acre in the 2nd year.			Profit or Loss from yields of both years after deducting cost of fertilisers.
	Plaster.	Acid Phosphate.	Sulphate of Ammonia.	Nitrate of Soda.	Muriate of Potash.	Cost of Fertiliser.	Rice Grains.	Chaff and Straw.	Value of Increase of Yield.	Rice Grains.	Chaff and Straw.	Value of Increase of Yield.	
	lb.	lb.	lb.	lb.	lb.	M.	lb.	lb.	M.	lb.	lb.	M.	M.
1	...	...	...	...	...	...	1046·3	1608·5	...	1338·0	915·5	...	...
2	...	...	178	...	...	23·96	954·4	1824·1	...	1611·3	999·0	22·02	− 8·61
3	...	356	...	...	...	18·13	1632·4	1792·9	42·54	1677·0	1186·4	24·61	+ 49·02
4	356	356	...	...	89	28·49	1427·2	1766 2	27·65	1635·9	1213·1	25·25	+ 24·41
5	356	...	178	...	89	34·32	1159·6	2105·1	8·22	1471·8	892·0	9·71	− 16·39
6	356	356	178	...	...	44·68	1659·1	1953·5	44·48	1632 4	1141·8	21·37	+ 21·17
7	...	356	178	...	89	49·86	1748·3	2354·9	50·96	1694·8	1141·8	25·90	+ 27·00
8	356	356	178	...	89	52·45	2123·0	2198·8	78·16	1726·0	1645·7	28·17	+ 53·88
9	356	356	...	245	89	53·42	1547·6	2114·0	36 39	1605·6	1110·5	19·43	+ 2·40

* Jahrbücher der "Cattedra ambulante" von Professor Tito Poggi, Rovigo.

The highest yield was obtained where all three of the plant-food ingredients had been applied, and on these plots a very good after effect was produced in the second year. Phosphoric acid proved very beneficial, especially upon the yield of grain.

Professor Poggi, Rovigo, makes the following recommendations for the quantities of fertilising materials to be applied per acre:—

	For New Fields.	For Exhausted Fields.
Sulphate of ammonia	89·0 lb.	178 lb.
Acid phosphate (16 per cent.)	222 5 „	356 „
Muriate of potash	44·5 „	89 „

267 to 356 lb. plaster or slaked lime should be applied to soils deficient in lime. In case of light soils, the quantity of muriate of potash applied per annum should not be less than 89 lb.

However, too much potash should not be applied to water rice, as this ingredient produces a luxurious formation of straw at the expense of the yield of grain. American rice-planters always recommend large quantities of potash for upland rice, holding that this is necessary to obtain a heavy yield of grain.

Mr. C. K. McQuarrie, of De Funiak Springs, Florida, holds that the presence of empty husks of upland rice is due to a deficiency of potash. He makes the following suggestions in regard to the planting of upland rice on the rather light soils of Florida:—

If a crop is going to be made on new land, it should be well ploughed during the previous winter, and harrowed over and over again, until all the sod is broken up. At the last harrowing 400 lb. of kainit per acre should be scattered broadcast. When ready to begin planting, furrows should be run with a bull-tongue plough, about 3 feet apart. In these furrows scatter about 300 lb. fertiliser per acre, containing phosphoric acid and potash, not less than 8 per cent. of each. This fertiliser must be well mixed with the soil by dragging a chain in the furrow. The seed must be sown liberally, as at least 25 per cent. of the rice generally grown is nothing but empty husks. After the plants are up, treat the crop to a little top-dressing of nitrate of soda. If the crop is planted in March or beginning of April, we can always depend on getting a second crop from the stubble of the first crop. This second crop is generally not so good as the first, but if fertilised when the first crop is cut it will repay us for our trouble.

Rice must not follow itself on the same land, as it greatly impoverishes the soil, but if we want to continue it on the same land green manuring and a liberal application of potash are absolutely essential. The leguminous plant should be sown early in the spring, and can be ploughed under in time for the first planting.

Animal Pathology.

THE STOCKOWNERS' INDEBTEDNESS TO THE MICROSCOPE.

BY C. J. POUND, F.R.M.S.,
Director of the Queensland Stock Institute.

THE following is the text of an address delivered by Mr. C. J. Pound, President of the Royal Society of Queensland, to the members of that body at the annual general meeting of the society on 31st January, 1898:—

On the present occasion I have thought it advisable, after due consideration, to depart from the usual custom of reviewing the past year's work of this or any other scientific society, by addressing you on a subject which immediately concerns the most important industry this colony possesses, viz.:—The stockowners' indebtedness to the microscope, and in order to make the subject more interesting to those engaged in pastoral pursuits I have introduced some notes on my own personal recollections of the invaluable benefit that some stockowners have derived by means of the microscope since I arrived in Australia some six years ago.

Up till within recent years the microscope was looked upon by most people merely as a scientific toy, and they believed that little or no benefit could be derived even from its very close acquaintance.

During my travels through the various pastoral districts of this colony, I am frequently asked if I have brought my microscope with me. On my replying in the affirmative I am at once met with a volley of questions, of which the following may be taken as typical examples:—(*a*) Will you show us all the snakes and insects in a drop of our tank water? (*b*) If I catch a beetle I suppose you will show it to us under your microscope? I reckon it looks like one of those devils that eat our peaches. You know what I mean—flying-foxes. (*c*) I suppose a mosquito would be as large as a goanna under your microscope? and so on. It is a very remarkable fact that what held good fifty years ago in regard to the popular idea of the nature of the microscope practically speaking holds good at the present time. In the year 1847 the late Dr. C. R. Goring, in an essay on the microscope, remarks that "the great mass of mankind will almost invariably be more delighted by an exhibition where they can see the whole object at once, though only moderately magnified, than by a display with a perfect high-power instrument, which shows only small detached parts prodigiously amplified. Occasionally I meet with people who are so unreasonable as to expect that opticians ought to make a microscope which would exhibit the whole of a laughing-jackass or a bullock magnified at least a million times, not being aware, I suppose, that the more we magnify any object the less we must be content to see of it, according to the law of nature and optics, whatever may be the construction of the glasses we employ. "Once," says Dr. Goring, who by the way was a most humorous microscopist, "I met with a virtuoso in Hyde Park who seemed to have effected a sort of approximation in his own way as to the kind of microscope the general public wanted, and was making a considerably handsome collection of half-pence upon the strength of it. He was exhibiting a variety of large objects with a compound microscope of the old fashion, which might perhaps magnify six times, and requesting the observers to look through the instrument (which was placed horizontally) with one eye, while they viewed Apsley House (which was three-quarters of a mile off) with the other, in order that they might form an idea of the stupendous powers of the splendid microscope submitted to their

examination for ½d.: 'Ladies and gen'lmun, just clap your hies to this ere vonderful and most stupendous hinsterment; it magnifies nearly one million of times or I'm a liar, and any of you may be kenwicted of the truth of what I says by looking at the diamond-beedle with one hi, while you sees Hapsley'Ouse with the hother. I'll be blowed if the beedle bint bigger nor that, and all of you knows Hapsley 'Ouse is a million times bigger nor the beedle.' The audience seemed perfectly satisfied with the demonstration; for mankind are always much obliged to anybody who will be at the trouble of humbugging them in their own way, and fortunately there will never be a lack of persons to do them this kindly office, putting profit of course entirely out of the question."

From these remarks I do not wish to infer that every stockowner I meet is ignorant of the nature and uses of the microscope; far from it. I have met with some who, I am pleased to say, are able to give a number of extremely useful tips and dodges in general microscopy, and in fact are quite familar with some of the recent discoveries in practical bacteriology; on the other hand, there are hundreds who, if they had the aptitude, are unable to meet with the opportunity of acquiring even a rudimentary knowledge of the microscope or its revelations in connection with animal diseases.

I intended when I commenced writing this address to briefly describe all animal diseases the study of which is known to be associated with the microscope; but I find that by dealing with the more important details of only four or five of the more common or every-day diseases, I shall be doing all justice to my subject. First of all I will take anthrax, as it was the first communicable disease discovered that was proved (by means of the microscope) to be caused by a specific organism, and it would be no exaggeration to say that the study of anthrax has been the groundwork for much of our recent bacteriological knowledge.

ANTHRAX.

Anthrax, sometimes called splenic fever or Cumberland disease, is a disease which is largely seen in cattle and sheep, and sometimes in the pig, horse, dog, and other domesticated animals; in fact, very few animals are proof against inoculation contagion. It is the most deadly disease to which the animal body is heir, and it runs its course with greater rapidity than does any other disease with which we are acquainted, death frequently resulting in cattle and sheep within the space of one or two hours after animals have been observed to be to all outward appearance in a perfect state of health. Its rapid course is only equalled by its malignity, few animals, especially cattle and sheep, recovering from its destructive influence. In the year 1850 Davaine and Rayer made the very important discovery of the bacillus *Anthracis*, which is the immediate cause of anthrax; and although they describe its relative size to the red corpuscles, and the fact that it is not possessed of any definite movement, as occurring in the blood of animals having died from splenic fever, they failed to recognise its real importance. In 1863, however, Davaine resumed his investigations, which he had discontinued thirteen years before, respecting the influence of the filamentous bodies which he had at that time noticed in the blood of animals which had died from splenic fever. These researches were carried on for many years, till, in 1873, he asserted positively that these rods, which, he called "Bacteridie du Charbon," were the essential cause of this malignant disease; they were constant in the blood of animals that died from anthrax, and that such blood when filtered and inoculated in animals had no effect.

Since that time our acquaintance with these bacilli has been greatly extended by Robert Koch and others, and our knowledge of their life history confirmed by the most exhaustive and careful investigation. These researches, which can only be carried out by the aid of the microscope, are still continuing, and we shall see later on what wonderful results in combating the symptoms their presence gives rise to; but we must briefly examine a little more in detail how the disease is communicable from animal to animal. If the blood

of a diseased animal be examined a little before or immediately after death, the vegetative rods of *Bacillus anthracis* are easily found by means of a suitable microscope. Now if the smallest quantity of such blood is introduced into the tissues of another animal capable of taking the disease, the inoculated animal becomes infected and almost certainly succumbs; and if the blood of the second animal be similarly examined this also will be found densely populated with the same bacilli. We thus see that the disease is accompanied by the enormous multiplication of the micro-organisms within the system of the infected animal, and that the disease may be indefinitely communicated from one animal to another; but we may also cause this bacillus to grow and multiply outside the animal system altogether, or, as we term it, cultivate the organism in an artificial medium. Thus, if we take on the point of a sterilised platinum needle the merest trace of blood of an animal just dead of anthrax, and then introduce the point of the needle into any of the ordinary cultivating media, such as broth, gelatine, agargar, and blood-serum, or even the surface of a boiled potato, we shall obtain in the course of a few days an abundant growth of the anthrax bacillus, readily visible to the naked eye and presenting a most characteristic growth. On microscopical examination we find that this peculiar wool-like growth is made up of bacilli held end to end in a delicate filamentous sheath. By continual microscopical examination of these filaments we shall notice that a number of extraordinary changes are brought about; the contents of each individual segment or bacillus in the filaments sooner or later become granular; at a later stage a very minute speck appears in the centre of each rod. These bright, highly refractile bodies are the so-called spores, which, in consequence of the greater power of resisting destruction, are of such importance in the propagation of this dreaded disease. In the blood of the subject affected, these anthrax bacilli are not able to form spores, but outside the body they give rise abundantly to these indestructible forms, and it is this power of producing spores which renders this organism so dangerous and persistent. Thus, if the carcasses of animals dead of anthrax are lightly buried or allowed to decay on the surface of the earth, the bacilli form spores in the soil, and healthy animals may thus become infected by taking the spores with their food when grazing. Again, the skin of animals which have died of anthrax in some countries, especially Russia, not infrequently pass into commerce, and often prove fatal to the tanners and wool-sorters who handle them even long afterwards. To give you some idea how tenacious of life and resistent these minute spores are, and how they retain their virulent properties, I have with me this evening a little bottle containing some silk threads which I impregnated with anthrax spores in May, 1886, nearly twelve years ago. In the first three successive winters in London they stood in a cupboard where the temperature was considerably below freezing point for several days, but since that time they have been kept in a moderately temperate atmosphere, but always in a desiccated condition. From time to time I test the virulence of these spores by placing a little piece of thread under the skin of a guinea pig, which results in the death of the animal (without any exception whatever), within twenty-four hours, of virulent anthrax. Moreover, on microscopical examination of a merest trace of blood taken from the spleen, the anthrax bacilli are readily demonstrated in large numbers. This experiment illustrates very clearly how the spores of the anthrax bacilli may get into the soil, and may remain there in a dormant state for many years. Anthrax has been known to break out among cattle grazing on a field where several years previously some Russian hides from infected animals had been buried. By some means or other the spores may contaminate the grass and hay imported from an anthrax-infected district, and may start the disease on a farm on which it had never been known to occur. The spores may be conveyed in a similar way with blood manure and bone manure, or with refuse used for manure. The skin, hair, wool, hoofs, and horns of infected animals, if soiled with blood, are contaminated by the bacillus. Bearing all these facts in mind, it will be seen how necessary it is that the strictest supervision should be exercised

whenever an outbreak of splenic fever or anthrax takes place, and that the disposal by cremation of the carcasses of the affected animals should be most vigorously enforced. Unfortunately those most closely connected with this disease are only too often quite ignorant of its dangers. Thus during an outbreak of this disease a few years ago in England, I recollect quite well the case of a butcher who was called in by the farmer to skin and dress some animals that had died from anthrax. Very naturally, like most butchers, he became bespattered with blood, and when the work was complete he went down to the other end of the paddock and washed his face and hands with water from a running stream, afterwards wiping them with some coarse sedgy grass, which produced several slight cuts through the skin. No notice whatever was taken of the cuts for several days, when suddenly on a considerable area around each cut there appeared an intense inflammation; on the following morning they became so painful that he decided to seek the advice of a medical man, who, after making full inquiries into the history of the case, came to the conclusion that the sores were true malignant pustules, undoubtedly caused by the anthrax bacilli gaining access to the sub-cutaneous tissues through the cuts produced by the coarse grass. Although several of the pustules were excised and others treated with strong antiseptics, it was too late to save the patient's life, for the anthrax bacilli had got into his general circulation, and his death resulted in a few hours from splenic fever. In England and on the Continent, when bacteriology was in its infancy, and microscopical science was scarcely considered necessary in veterinary schools, it was by no means an uncommon occurrence to hear of a veterinary surgeon being attacked with anthrax, which in some instances proved fatal. Happily these days are past, for now in every veterinary teaching institution in England, Continental countries, and America, the science of bacteriology is recognised in the highest possible degree; consequently students of the present day are in a position to acquire an all-round knowledge of practical bacteriology, even probably more so than medical students, which is accounted for by the fact that so many of the diseases peculiar to the lower animals have been proved to be entirely due to microbic origin.

We all know that early recognition and prompt action are essential to prevent the spread of any communicable diseases. By means of Koch's discovery we are able to give a definite opinion in less than three minutes whether an animal has died of anthrax or not. Unfortunately, in the case of anthrax, only too often the first indication of the existence of the disease is the sudden death of an apparently healthy animal. Nevertheless, the importance of being able to recognise the bacillus in the first animal that dies cannot be over-estimated, and this is where the microscope scores, for it proves at once that it is quite unnecessary to perform the dangerous task of making an elaborate *post-mortem* examination in order to satisfy oneself that the disease is really anthrax. All bacteriologists are deeply indebted to Robert Koch as the first to point out in the year 1876 that the anthrax bacillus, as seen in the blood of infected animals, was morphologically different from any other known bacillus; and although twenty years have elapsed, during which period a considerable number of new (pathogenic and non-pathogenic) organisms have been brought to light, it is a remarkable fact that this discovery of Koch still holds the same unique position, for not a single new bacillus has been found with the characteristic square-cut ends of the anthrax bacillus.

IMMUNITY AND PROTECTIVE INOCULATION.

During his investigations Pasteur discovered that cattle and sheep, after recovering from one attack of anthrax, were protected from a second attack, and in 1882 he elaborated a method by which a mild form of the disease could be given to animals, which rendered them perfectly harmless against a subsequent inoculation with virulent bacilli. He found that the continued growth of anthrax bacilli at an abnormally high temperature (42 to 43 degrees Centigrade) caused them to lose their power of developing endospores, and also to gradually lose their virulence. In fact, this virulence can be gradually

attenuated till it ceases to be dangerous even to that most susceptible of all experimental animals, the domestic mouse. Prompted by the result of these discoveries, Pasteur then attempted with success to use the attenuated bacillis of anthrax for protective inoculation against the virulent bacillus. He was able to show that if an animal is inoculated with the bacillus attenuated to the degree requisite for it—that is, for that species of animal—it either does not sicken, or it sickens slightly and recovers from the disease. It resists then the infection with less attenuated bacilli, and after the next inoculation it resists the bacilli which possesses the highest degree of virulence. Pasteur did not delay in making this brillant laboratory achievement available for practical application. The first great experiment with this attenuated virus outside the laboratory is particularly noteworthy, and of such historical interest that I cannot refrain from giving a brief account of it.

On the 5th of May, 1881, Pasteur obtained 24 sheep, 1 goat, and 6 cows (all of which are peculiarly susceptible to anthrax), and inoculated them with the fully attenuated virus, and twelve days later they were again inoculated with a rather less attenuated, or rather stronger, virus. On the 31st of May all these inoculated animals, as well as 24 sheep, 1 goat, and 4 cows not previously inoculated, received severally an injection of virulent blood from an animal recently dead of anthrax. On the 2nd of June, three days later, 21 sheep and the goat which had not been protectively inoculated were dead, 2 other sheep were dying, and the last one was attacked later in the day, whilst not one of the previously inoculated animals was affected.

It is difficult for anyone not engaged in scientific pursuits to fully realise how the triumph of that moment must have rewarded the years of patient and persevering labour of the seeker after truth. The value of Pasteur's system of protective inoculation for anthrax was not long in being recognised, and in a few years gained a foothold in different countries throughout the world where the disease is endemic.

In 1889 Pasteur's representatives, Dr. Germont and M. Loir, gave a practical demonstration of the efficacy of Pasteur's perfected system before a specially appointed committee at Junee, in New South Wales. On the 3rd of September, 20 sheep and 4 cattle were inoculated with the first vaccine, and on the 18th they were all inoculated with the second vaccine. On the 2nd of October all these vaccinated animals and 19 sheep and 2 cattle (not previously inoculated) were inoculated with blood obtained from a sheep just dead of virulent anthrax, with the result that all of the 19 sheep and 1 of the 2 cows died, while not one of the 20 sheep and 4 cattle showed even the slightest signs of sickness. So successful was this demonstration considered by the committee that they recommended its general adoption to stockowners throughout the colony. Since that time hundreds of thousands of sheep have been vaccinated annually.

In concluding these remarks on anthrax, I must ask you to bear in mind that this marvellous discovery of M. Pasteur, from which stockowners throughout the world have so much benefit, was originally the outcome of microscopical investigation; in fact, even at the present time the preparation of anthrax vaccine cannot be conducted on a reliable scientific basis without the assistance of the microscope.

TETANUS.

Tetanus has long been known as a communicable disease of man, and especially the lower animals, characterised by spasmodic contraction of the muscles, commencing near the seat of inoculation and gradually extending to all parts of the body. It is more commonly the result of some abrasion of the skin, especially after wounds produced by old rusty nails or splinters of wood contaminated with earth or dust, and before the days of antiseptic surgery frequently followed surgical operations. Carle and Rattone, in 1884, were the first to prove that the disease could be communicated from man to animals by inoculating twelve rabbits with pus, of which eleven died from tetanus. In

the following year another observer found that mice and guinea-pigs inoculated with garden earth invariably contracted tetanus, and, moreover, in the pus which he found at the seat of inoculation he always found a characteristic bacillus; but it was not until 1889 that the celebrated Japanese bacteriologist, Kitasato, obtained pure cultures of this bacillus and worked out its life history, and further proved that it belonged to the anaerobic group of organisms—viz., those that live and reproduce their species without free access to oxygen. A very remarkable feature about the tetanus organism is that spore formation takes place at the end of the bacillus, which when complete has the appearance of a drumstick.

Kitasato, in the course of his experiments on the poisonous properties of the tetanus bacillus, succeeded in making animals immune to tetanus, and subsequently made the discovery that the blood of immune animals will produce immunity when injected into other animals; which resulted in a number of eminent investigators taking up this important subject, and thanks to the combined researches of Tizzoni, Cattani, Breiger, Faber, Vallaird, Vincent, Kitasato, Roux, and Nocard, we have at the present day an antitoxic serum whose therapeutic value and as a preventive of tetanus has been firmly established. It is, however, only fair to point out that there have been a number of reported failures when the antitoxic serum has been used as a means of curing tetanus; but it is equally fair to state that almost without exception the treatment was unavoidably commenced when the tetanic symptoms had become extremely well pronounced, at which stage, according to our present knowledge, there is very little hope of saving life. To veterinary practitioners it is a well-known fact that the owner of a horse which is suffering from tetanus rarely ever seeks professional advice until he thinks there is no possible chance whatever of the animal recovering.

In a recent communication to the Paris Academy of Medicine, M. Nocard says that from from experimental as well as from the clinical point of view the antitoxic serum employed as a preventive of tetanus in the horse has had wonderful success, but when applied to the treatment of declared tetanus was (for reasons previously given) almost always a failure. However, in the presence of reliable information collected by practitioners who have treated tetanus with antitoxine, M. Nocard considers this mode of treatment still the best; for if it does not increase the number of cures, it gives on the contrary remarkable results from a preventive point of view. In 2,707 animals which had recently received two injections each of the antitoxic serum, not a single case of tetanus was observed in districts where the malady had made many victims some days or weeks previously. On the other hand, during the time this experiment lasted M. Nocard and his colleagues observed 259 cases of tetanus in animals not treated preventively. M. Nocard accordingly recommends the serum treatment of tetanus in regions where this malady is observed, and particularly after surgical operations which most predispose to it. He terminates his last communication by repeating, with M. Warnesson, of Versailles, that, "employed preventively, the efficacy of anti-tetanic serum is absolute." It is worthy of note that this last statement of so distinguished a scientist as M. Nocard could never have been made but for the microscopical discoveries of previous observers.

I may say that at the present time this method of preventive treatment for tetanus is largely used by veterinary surgeons in England, on the Continent of Europe, and in America, and I see no reason why its use should not be extended to these colonies.

ACTINOMYCOSIS.

Actinomycosis is a disease the accurate diagnosis of which calls for the aid of the microscope. Until the year 1876 the true nature of this disease had, with few exceptions, been overlooked. Cases in cattle were known under a variety of names, such as wens, scirrhous, scrofulous and tuberculous tumours, osteosarcoma, wooden tongue, polyphus or lymphoma and clyers of the throat, bone cancer, spina ventosa, chronic abscess, caries of the bone, etc. Although

these various names were each supposed to represent a distinct form of disease, recent researches with the aid of the microscope have shown that they are one and all the same, and consequently are now classed under one head—viz., actinomycosis. From the early part of the present century till 1875 numerous well-known observers, including Dick, Langenbeck, Lebert, Rivolta, Johne, Robin, and Perroncito, wrote most elaborate essays on this disease. None of these observers, however, proved conclusively the true nature of the cases which they described. In 1876 Bollinger threw an entirely new light on the subject by the accurate description and identification of the characteristic micro-organism which has given the name to this disease. His investigations applied only to cattle; but in the following year J. Israel described a similar affection in man, and in 1879 Ponfick brought strong evidence to prove the identity of the disease in man with that which occurs in cattle. Since this time the identity of the two diseases has been generally recognised, though no definite casual relation has yet been traced between them.

In advanced stages of the disease the fungus may be detected with the naked eye in the muco-purulent discharge or in a scraping from the cut surface of a growth. The tufts of the fungus vary in size under different circumstances from a grain of sand to that of a pin's head, and appear to be yellowish white in colour. On examination under the microscope these little tufts appear to be made up of a mass of club-shaped bodies resembling, to a certain extent, soda-water bottles with the narrow ends attached to the centre, thus forming a delicate-rayed rosette; in fact, they will call to mind, on focusing in turn the centre and the periphery, the appearance of a composite flower.

In some cases, especially in the early stage, the fungus is made up almost entirely of a mass of delicate filaments or mycelium, which have been proved by numerous observers to be the active or vegetable stage of the organisms. My friend Prof. Crookshank, of King's College, London, has shown that the club-shaped end is in reality the terminal part of the filaments; moreover, he is of opinion that the clubs are mucilaginous expansions of the sheath of filaments which become highly developed when the organism is growing in the animal tissues. In some cases of actinomycosis that I have examined lately I find neither clubs nor definite mycelium, but a mass of what appears to be micrococci and apparently short broken-up filaments. That I was dealing with actinomycosis was subsequently proved by placing a little of the growth on several tubes of agar-agar, when, after several weeks' incubation at 37 degrees Centigrade, I obtained a series of the most luxuriant cultures of the actinomyces fungus. The naked-eye appearance of a cultivation of the actinomyces fungus is very striking and absolutely characteristic; in fact, I know of no other organism that bears even the slightest resemblance to it. The growth after a few days on the surface of agar-agar or blood-serum at the temperature of the blood forms little white, shining, moist colonies, which may remain stationary or increase and coalesce. In a week or ten days, sometimes earlier and sometimes after several weeks, the culture turns a bright yellow or yellowish-brown. After a time a powdery sulphur efflorescence makes its appearance on the surface of the culture, which at this time begins to develop a peculiar sour smell. The stage of efflorescence corresponds with the breaking up of the filaments into masses of cocci and chains closely resembling strepto-cocci. Preparation of the fungus, either from cultivation or from the animal tissues, can be stained readily in a variety of ways, Gram's and Plaut's being the principal methods used; moreover, it is interesting to know that in sections of an actinomycotic growth the tissues can be contrasted with some differential stain, which greatly facilitates the detection of the fungus with the microscope.

From this brief sketch it would appear that the detection of actinomycosis was an easy matter. So it is in the majority of cases; sometimes an accurate diagnosis by means of the microscope, without even the aid of anilyne dye, can be made in three minutes; on the other hand, I have met cases which baffled several of us working closely together for several days, and the positive result of the diagnosis was obtained solely by persistent work with the microscope.

Several of the cases of more than passing interest are here well worthy of recording:—

Mr. E. Stanley, Chief Veterinary Surgeon to the Board of Health, Sydney, during his usual inspection of the saleyards in and around Sydney on one occasion, informed me that he had a splendid case of tuberculosis in the udder of a cow which had been recently consigned for sale from a ladies' college on account of the gradual diminution of the supply of milk. A physical examination revealed the fact that only the right anterior quarter of the mammary gland was sound, while the other three quarters were more or less indurated. The animal was condemned and killed for tuberculosis, and on *post-mortem* examination the original opinion was maintained. The next step was to confirm or otherwise this diagnosis by microscopical examination of the diseased parts of the udder, which work the Board of Health entrusted to me. I worked away cutting sections and examining specimens with the microscope for three days, but, although I could find all the necessery histological elements of tubercle, I failed to discover a single tubercle bacillus. Mr. Stanley suggesting that the staining reagents might have deteriorated, I therefore made up another fresh lot of stains, and then prepared another series of specimens, which we, independently, carefully examined, but with the same negative result as before. After this somewhat lengthy and tedious microscopical examination it was resolved as a last resource to cut up into slices that portion of the gland which was intended to be preserved as a museum specimen, with the hope of throwing a little extra light on the nature of what now appeared to be a mysterious disease. My efforts were at last rewarded by the fact that I discovered on the cut surfaces of two of the slices several little hard, dark-brown coloured grains, each about the size of a pin's head. These grains were placed on a micro-slide, and on adding a little drop of hydrochloric acid they immediately began to effervesce, thus demonstrating their calcareous nature. When the effervescence had ceased a little glycerine was added, and the specimen examined under the microscope, when to my astonishment what was supposed to be a case of tuberculosis now proved to be one of actinomycosis, for I readily detected the presence of characteristic clubs of the actinomyces fungus, while the calcareous condition of the little fungus-tufts at once explained that the micro-organisms were undergoing degenerative changes which would readily account for their scarcity in the indurated tissues.

The second case I wish to bring under notice is that of a high-class pedigree bull belonging to a well-known breeder in this colony. The owner came to me and stated he believed that this valuable animal, which he had only recently imported, was affected with tubercular tumours in the lower region of the throat, which if it should be true would mean the immediate destruction of the animal, and perhaps a claim for compensation against the original owner of the animal in England. During the cold weather the animal, which was extremely quiet and good-tempered, was kept in a stable with a halter round its neck. Apparently by continual friction of the rope, the skin of the neck got rubbed so much immediately above one of the tumours as to cause an open sore, which gradually increased in size. In the course of a few weeks one of the tumours commenced to disconnect itself from the surrounding subcutaneous tissues, and eventually sloughed out. The tumour, which was about the size of an orange and very firm in consistency, was forwarded to me for microscopical examination, which proved as difficult a task as in the previous case. However, after repeated examinations I was again successful in demonstrating that the tumour was one of actinomycotic origin, and, as in the case of the mammary gland, the fungus was undergoing calcareous degeneration. The second tumour was subsequently removed by operation, and on microscopical examination turned out to be, as was anticipated, of the same character as the first tumour. Although this event took place two years ago, the animal has never exhibited any further manifestation of this disease; in fact, at the present time, I am informed, he is a perfect picture of health. Needless to say the owner was more than gratified at the result of these examinations, and

even now frequently sings praises of the valuable assistance which the microscope rendered in saving the life of what is at the present time a champion animal of his class in Australia.

TUBERCULOSIS.

There is no known disease which has a wider distribution than tuberculosis. The study of this disease in all its manifestations has claimed the attention of the greatest scientific minds throughout the world; the original manuscripts alone of these investigators would more than fill this room, and yet, although so much information has been elucidated in connection with this disease, there still remains practically an inexhaustive field for experimental research work for the most persevering and painstaking of investigators. Not only is tuberculosis the most common disease in mankind, but there is no other disease in existence which attacks so many different kinds of animals. Not one of our domesticated animals is completely refractory to it; they simply vary in their degree of susceptibility. The first person to claim the honour of having demonstrated the contagiousness of the disease was Villemin in 1865, whose experiments were subsequently confirmed by Cohnheim. In the year 1882 that celebrated bacteriologist, Robert Koch, as a result of his masterly and extremely delicate researches with the microscope, announced the discovery of the tubercle bacillus, which he succeeded in isolating and cultivating outside the animal body on artificial nutrient media; further, by inoculating guinea-pigs with small portions of the cultivations, he invariably produced tuberculosis, which caused the death of the animal; and last, but not least, he again found unmistakable evidence of the presence of tubercle bacilli in all the lesions of the disease. These investigations justified Koch in expressing the opinion that "without the tubercle bacillus there could be no tuberculosis"—a fact which has been maintained up to the present day. For many years it was generally believed that the blood-serum media as used by Koch was the only one on which the tubercle bacilli could be cultivated, but Roux, of the Pasteur Institute, found that a more favourable medium could be found in nutrient agar-agar with the addition of about 6 per cent. of glycerine. On this the bacillus grows abundantly and rapidly; the growth stands out from the surface of the solid medium and takes the form of small yellowish-white lichenoid grains, which are dry, dense, and difficult to crush, each grain containing hundred of thousands of bacilli. In the case of liquid media, the growth takes place either at the bottom of the vessel in the form of extremely small yellowish-white grains, development being retarded owing to the limited supply of oxygen, or at the surface, where it has free access to oxygen in the form of a delicate crinkled yellowish-white film, which rapidly develops in a felted mass. All cultures when they arrive at a certain stage of development give off a peculiar, somewhat unpleasant, flowery odour. Although the most favourable temperature for the cultivation of the tubercle bacillus is about blood heat (37 degrees Centigrade or 98·6 degrees Fahrenheit), recent experiments have shown that it will grow quite readily at the ordinary temperature of the room even on sterilised potatoes or beetroot, and in honey, milk, and urine. Koch showed by his discoveries, which have been slightly modified by other observers, that the tubercle bacillus behaves in a characteristic manner to some of the aniline dyes—in fact, to demonstrate it a special method of staining is necessary—which enables us at once to distinguish it by means of the microscope from all other micro-organisms. The most reliable and simple method for staining tubercle bacilli is a modification by Ziehl-Neelsen. The preparation, cover-glass, or section is placed in a watch-glass full of carbolised fuchsine for about five minutes, then washed in water to remove the surplus stain, afterwards plunged into a 33 per cent. solution of sulphuric acid, or, as some people prefer, a 10 per cent. solution of nitric acid, until perfectly decolorised; the staining process is then completed by immersion in an aqueous solution of methylene blue; afterwards the preparation is again washed in water, dried, and finally mounted in Canada balsam dissolved in xylol. When such a preparation is examined under a suitable microscope, it

will be found that the bacilli of tuberculosis alone have retained the primary red colouration (fuchsine), while all other micro-organisms and any histological elements which may be present are decolorised by the acid, but have taken on the contrast or background stain, methylene blue. This invaluable method (which is practised all over the world) is almost in daily use in our Stock Institute in Brisbane, being principally employed for detecting tubercle bacilli in sputum from phthisical patients, milk of cows suffering from tubercular mammittis, and various morbid specimens; but its chief use is in connection with providing stockowners in this and the neighbouring colonies with pure pleuro-pneumonia virus, guaranteed to be as free as modern bacteriological examination will allow from all traces of tubercular taint. Last year over 100,000 head of cattle in Queensland and New South Wales were inoculated with virus supplied by this Institute. Just think for a moment what this means. The mass of overwhelming evidence, experimental and otherwise, has proved beyond all doubt that the prevalence of tuberculosis among cattle in these colonies is mainly due to the evil effects of the indiscriminate method of inoculation for pleuro-pneumonia with virus obtained from an animal also affected with tuberculosis, although not necessarily showing naked-eye lesions of this disease; and further, as an example, I found tubercle bacilli in three out of five animals killed for pleuro-pneumonia virus and supplied by one individual alone, and that, if this virus had not been examined microscopically, it would have been used for inoculating upwards of 3,000 head of cattle. Therefore, stockowners should cheerfully appreciate the invaluable work that is being executed for their benefit by means of the microscope in the crusade against tuberculosis. It does not follow that every animal inoculated with virus containing tubercle bacilli will be affected with tuberculosis; there is always a percentage of animals in every herd that are practically insusceptible to the disease even by inoculation; on the other hand, an exhaustive series of experiments conducted at the Indooroopilly Experiment Station proved that the disease can be induced in some animals quite readily. Therefore, as tuberculosis has been clearly shown to be a preventable disease, why not prevent it in the direction of using pleuro lymph that has withstood the bacteriological test? There is no objection whatever to stockowners declining to use the departmental lymph, although it is highly desirable that the virus collected by themselves should subsequently pass through the Stock Institute, otherwise it cannot be recommended with safety for inoculation purposes. In a report recently issued by the Sydney Board of Health, Dr. Ashburton Thompson ventures to remark that "it should be made illegal to inoculate for pleuro-pneumonia except with virus taken from animals ascertained to be free from tuberculosis."

On the prevalence of tuberculosis in cattle in various countries, Nocard says the power which tuberculosis possesses of spreading among cattle is not sufficiently known. There are some countries among the most advanced in breeding, rearing, and animal hygiene, where the number of tuberculous cattle is more than 20 per cent. of the total bovine population. In Saxony, for instance, the official statistics of the abattoirs under inspection show that the number of animals recognised as tuberculous was, in 1891, 17·4 per cent.; in 1892, 17·79 per cent.; in 1893, 18·26 per cent.; while in some towns the proportion reached 30 per cent. At the Copenhagen abattoir the proportion of tuberculous animals in 1891 reached 30 per cent. Out of 125,000 cattle slaughtered in Berlin in 1891 almost 15,000 or 12 per cent. were tuberculous. At the abattoir of Toulouse in 1889, 1,254 animals out of 13,507 were found to be tuberculous. As the terms of inspection did not meet with the wishes of the owners, the number of tuberculous animals fell in 1890 to 340 out of 12,694 slaughtered, about a quarter of the number of the preceding year. The surplus had been turned on to private slaughter-houses not under inspection.

Although legislation with regard to tuberculosis and the inspection of abattoirs in England is still in a rudimentary state, we get from that country very valuable statistics. It is well known what admirable energy and the

amount of money the English have expended in order to stamp out contagious pleuro-pneumonia. Their Act of 1890 orders the slaughter, not only of the sick and suspected, but also of all animals that have been in contact with the sick. In 1891 there were thus slaughtered, in different parts of England and Scotland, nearly 10,000 animals (of which only 800 were sick); *post-mortems* were made on these 10,000 animals, and 1,260 were tuberculous, or 12½ per cent. In 1892 the operation was continued, but was brought to bear on much smaller numbers, pleuro-pneumonia being on the decrease. However, there were slaughtered 3,600 animals (of which 134 were sick), and of this number nearly 800 were tuberculous, or 22 per cent. This high proportion is due to the fact that the slaughtering operations were brought to bear on some of the most crowded and anciently infected cowhouses in London, some of which had as many as 50, 60, and 70 per cent. of their cows affected with tuberculosis.

Causes of Tuberculosis.—Up to quite recently medical men, veterinary surgeons, and the public generally looked upon tuberculosis as a true type of hereditary diseases. Even at the present day stockbreeders will endeavour to bring forward, apparently, the most convincing evidence from their point of view to support this supposition; but the statistics obtained from the various continental abattoirs disagree with this theory almost entirely; in fact, all the inspectors are of the one opinion that there is nothing more rare than tuberculosis of the calf. Here are some figures demonstrating this point:—At the Munich abattoir 160,000 calves are slaughtered yearly on an average, and out of this number there have been found tuberculous—2 in 1878, 1 in 1879, none in 1880, none in 1881, and 2 in 1882. At Lyons, M. Leclerc, who has taken a particular interest in this question, has only found 5 tuberculous calves out of 400,000 slaughtered at the public abattoir. At Rouen, Veysierre has found 3 out of 60,000. At Berlin, Johne has found 4 out of more than 150,000. In Prussia, from 1st April, 1892, to 31st March, 1893, there were slaughtered in the public abattoirs 600,501 adult cattle, of which 52,136 were tuberculous, or 8·68 per cent.; and 914,216 calves, of which only 446 were tuberculous, or a little less than ·04 per cent. To thoroughly appreciate these figures, it must not be forgotten, as Nocard points out, that everywhere the number of tuberculous cows is infinitely greater than that of other cattle.

Among the various hereditary and predisposing causes which may be regarded as factors to diminish the resisting properties of the animal tissues to the action of the tubercle bacillus, are unhealthy surroundings, close and ill-ventilated buildings, dark stables, insufficient or unwholesome food, breeding too young or too frequently, or late breeding, overfeeding to secure an abnormal production of milk—in fact, any treatment of cattle that tends to debilitate or over-stimulate—may be considered as a predisposing cause. These conditions, some of which are too often imposed, require the very serious consideration of the breeder of stud cattle, those engaged in raising store cattle, the producer of fat stock, the dairy farmer, and even the bullock-driver, all of whom are anxious to possess sound and healthy animals with vigorous constitutions. Stockbreeders should bear in mind that the predisposing cause can under no circumstances result in tuberculosis without action of the essential cause; and the tubercle bacillus is certain to produce its specific pathogenic effect in tissues that are impaired by hereditary or acquired causes. As for Koch, whose authority in the matter is undeniable, he declares that although he has conducted hundreds of most crucial experiments, he has never seen any of his female guinea-pigs, when tuberculous, transmit the disease to their offspring. According to him, hereditary tuberculosis finds its most natural explanation; for what the mother does transmit to its offspring is not the disease itself, but the predisposition or proneness to contract the disease. In other words, the offspring is born tuberculisable, not tuberculous.

These well-established facts tend to prove that heredity plays a very small part, and contagion a great part, in the propagation of bovine tuberculosis, and that if the young born of tuberculous parents were protected from cohabitation, and the ingestion of tubercular milk, the importance of heredity as a

cause of the disease or even the predisosition to it would gradually dwindle away into insignificance. In Denmark, Professor Bang has shown that by exercising a little care, and the free application of tuberculin, how comparatively easy it is to protect cattle from infection, and how a healthy herd may be bred from a severely infected one.

As evidence of this, Nocard says:—"I had occasion to test with tuberculin all the animals on a large and fine farm in the north of France; 55 out of 105 were tuberculous—46 out of 57 adults; 9 out of 42 aged from four months to two years. Twenty months later I repeated the test on 30 of the young animals which had escaped infection, and on 14 more which had been born since the first trial. Of this number 25 were born of tuberculous mothers. Not one of these animals gave the slightest reaction—not one had become tuberculous; and most of them are now two, two and a-half, three, and more years old."

After the first trial all the healthy animals were strictly isolated from the affected ones.

Methods of Detecting Tuberculosis.—Comparative pathologists are agreed that there are several diseases which may simulate and be mistaken for bovine tuberculosis. Therefore on all occasions, when possible, the clinical diagnosis ought to be controlled by bacteriological examination of the suspected products—pus, discharge from the nostrils, expectoration, glandular pulp, milk, &c. If Koch's bacillus is found, with all its well-defined and peculiar histo-chemical characters, the existence of tuberculosis may be affirmed. If the search for tubercle bacilli does not give positive results, as is often the case in cattle, experimental diagnosis is proceeded with. This is done by injecting some of the suspected products directly into the peritoneal cavity of one or more guinea-pigs, which are extremely susceptible to tuberculosis. Should the inoculated material be tuberculous, its virulence will be proven by the progress of the disease, the first symptoms usually appearing in from twenty-five to thirty days, when the animal may be killed and examined. On *post-mortem*, the lympathic glands and spleen will be seen to be considerably enlarged and crowded with tubercular nodules, while the liver and lungs will be less severely attacked. If these appearances are confirmed by microscopical examination, the diagnosis is thus made complete.

The two methods just described are, of course, inapplicable when tuberculosis in the suspected animal is confined to the abdominal organs, to serous membranes, or to glands of cavities; consequently they are impracticable for general use. But, thanks to the researches of Koch, we have in the agent known as tuberculin a most perfect test for tuberculosis. Experiments made by thousands in all countries have shown that Koch's tuberculin, injected in small doses under the skin of suspected cattle, sets up in tuberculous animals alone an intense febrile reaction, permitting one to assert the existence of lesions so minute that all other methods of diagnosis, bacteriological and clinical, would be powerless to reveal their presence, or even to make one suspect their existence—in fact, it becomes so near being an infallible test that the errors of diagnosis, based on its constant use, are practically *nil*.

It may be asked, What is tuberculin, and how is it applied? Tuberculin is a simple glycerine extract of the toxic products of a broth culture of the tubercle bacillus; but its preparation, although not at all difficult, requires very special care.

A culture of tubercle bacilli in glycerine nutrient medium of special formula, after five or six weeks in the incubator at a uniform temperature of 37 degrees Centigrade, is sterilised in an autoclave at 110 degrees Centigrade; it is then concentrated *in vacuo* in the presence of sulphuric acid till the bulk of the culture is reduced to a tenth part of the original quantity, then passed through a specially designed Pasteur-Chamberland porcelain filter under an air pressure of about 400 lb. on the square inch, which strains all the remains of the dead bacilli from the liquid, and afterwards kept in well-stoppered bottles and protected from light and heat. As the original culture contained 5 per

cent. of glycerine, the evaporated product contains about 50 per cent., which explains why it retains its activity for so long. During the inoculation of a large number of flasks of nutrient media on different occasions, the number of tubercle bacilli introduced cannot possibly be the same in quantity for every flask; it therefore naturally follows that there must be a corresponding difference in the quantity and quality of the tuberculin produced. This difficulty can only be overcome by the delicate operation of "standardising," which is carried out by injection of the tuberculin into healthy guinea-pigs.

On the Use of Tuberculin.—The injection of tuberculin in recognised standard quantities is always innocuous; performed on milking cows, it in no way affects either the quantity or quality of the milk produced, and it in no way interferes with gestation, even in animals about to calve. The usual practice in applying tuberculin as a means of diagnosing tuberculosis in cattle is first of all to determine the normal temperature of the animal, which is done by the use of the clinical thermometer. For ordinary purposes tuberculin is employed diluted to the extent of one-tenth in carbolised water, 5 per 1,000. The best plan is to inject at one time beneath the skin, behind the shoulder, 3 to 4 cubic centimetres of the dilution (3 cubic centimetres for cows of medium size, $3\frac{1}{2}$ for large cows, and 4 for bulls and high-class animals). The temperature of the animal must be taken before the injection, which in general practice it is usually desirable to make about 6 p.m. The temperature of the suspected animal is taken again next morning at 6 o'clock, then at 9 a.m., 12 noon, 3 p.m., and the last one at 6 p.m. The diagnostic reaction is measured by the difference between the initial normal temperature, which is about 101·5 Fahrenheit, and the highest temperature recorded after injection. If this difference exceeds 1·5 Centigrade, equal to 2·7 degrees Fahrenheit, it may be affirmed that the animal is tuberculous. It may happen that the animal at the time of the proposed injection is feverish. This is caused often enough by hot weather, excitement, or by some passing irregularity of the digestive functions, and other physiological changes. It is better in such cases to defer the operation. It is important also to remember that in very tuberculous animals, those especially which are phthisical in the proper sense of the word, the injection of tuberculin may produce no rise of temperature whatsoever; but there is no difficulty in these cases, as the clinical diagnosis is always very easy.

As an example of the certainty of tuberculin as a means of diagnosing tuberculosis in cattle, I will refer to the testing of the historical "Althorp Park" herd of high-class pedigree Jerseys, belonging to Lord Spencer. In September, 1893, Professor McFadyean, of the Royal Veterinary College, London, paid a visit to Althorp Park in order to inspect the herd, as two of the animals were reported to have died a short time previously from tuberculosis. The herd comprised 18 cows, 1 bull, and 4 yearling heifers. On clinical examination only one of the animals was suspected—viz., a cow in which there was a distinct enlargement of one of the pharyngeal-lymphatic glands. In none of the animals were the respiratory movements notably disturbed. The man in charge reported that all the animals fed well, and that he had not observed that any of them had a cough. With one exception, the general condition of every animal in the herd was excellent, and this exception was the cow referred to, which was thirteen years old. The result of Professor McFadyean's examination may be summed up by saying that certainly in not more than one of the twenty-three animals could he, with any degree of confidence, have diagnosed tuberculosis. But, since two members of the herd had recently died from tuberculosis, there was a very strong presumption that more than one or two of the survivors must have become infected, and the only hope of saving the yet healthy individuals lay in being able to "weed out" these infected animals. Ordinary clinical examination being then of little service, the case appeared to be one eminently suitable for the employment of the tuberculin test, which Lord Spencer promptly consented to have carried out. The general result of the injection of tuberculin was truly startling, for it appeared that not a single animal was free from the disease. As a preliminary

test of the accuracy of the indication afforded by the tuberculin, two of the animals, although in excellent condition, but showing a more pronounced reaction in temperature, were killed, and on *post-mortem* examination a number of tuberculous lesions were found. This discovery of tuberculosis in two of the healthiest-looking animals indicated a most serious degree of contamination of the herd, and Lord Spencer accordingly decided to have the remaining animals slaughtered. This was carried out, and a careful *post-mortem* examination of each animal revealed the fact that every animal was affected with some manifestation of tuberculosis, thus proving the absolute certainty of tuberculin as an aid in the diagnosis of tuberculosis in cattle.

Another exceedingly interesting experiment is that carried out on the herd at the Agricultural Experiment Station in Vermont, U.S.A., by F. A. Rich, State Veterinarian. The herd consisted of 21 Jerseys, 6 Ayrshires, and 6 Holsteins—33 head altogether, including 3 bulls, 24 cows, and 5 calves. In January, 1894, Mr. Rich made a physical examination of the herd, and found in two cows symptoms which might be taken for tuberculosis, and, as it was suspected that some of the other animals might be affected, it was decided to test the entire herd with tuberculin, which was accordingly carried out, with the result that the 3 bulls, 16 cows, and 2 calves, a total of 21 animals, being nearly 64 per cent. of the entire herd, reacted to the tuberculin, and it is still more interesting to know that, although most of the animals which reacted were in splendid condition and giving a large supply of milk, they were ordered to be slaughtered, and the *post-mortem* examination confirmed the tuberculin test without exception. The remaining healthy animals were at once removed to another shed, while the infected one was thoroughly washed with hot water. Following this, every square inch of woodwork was sprayed with a solution of corrosive sublimate (1 to 1,000), and then 125 lb. of sulphur was burned in the tightly-closed shed and cellar beneath. This being done, all the woodwork of the mangers and in front of the stanchions was torn out and replaced with new, after which the double sterilisation with corrosive sublimate and sulphur was repeated, and the shed once again used for housing cattle. Six months later eighteen grade Jersey cattle were purchased from various herds and subjected to the tuberculin tests. All of these animals were found to be free from tuberculosis, but it was definitely decided to test these and the remaining healthy animals of the original herd every six months. It was the aim of the station to make its former herd of moderate-priced animals produce from 350 to 400 lb. per cow per annum by such methods as any dairyman might use. The Board of Control of the station state it is again their intention to seek the same end, and at the same time to keep the herd healthy by the free application of the tuberculin test. Here is an object lesson and an example which dairy farmers in Queensland should follow, but this is a matter which, in all probability, will be initiated and placed on a firm basis at our Agricultural College at Gatton.

The insidious nature of tuberculosis, Professor Walley says, has much to do with the comparative slowness with which public attention has been directed to it, but the strides which it has made and the hold it has gained on our stock renders it one of the most important questions affecting the future well-being of the bovine species. Looking at an individual tubercle bacillus, we might be led to despise its comparative insignificance, and to ignore its deadly meaning; but when we know that thousands upon thousands of these micro-organisms exist in the body of a single animal, a truth is forced upon our minds, which we cannot refuse to recognise—viz., that we have to deal with an insidious, implacable, and deadly foe, and independently of its ultimate fatality it may be said with safety that there is no disease known to the pathologist which gives rise to so many functional derangements. Contagious pleuro-pneumonia, foot and mouth disease, rinderpest, and tick fever are each in their turns terrible scourges. Are they greater scourges than tuberculosis? I think not, for although they sweep their victims off in a manner which is seen by all there is not that vast deterioration and slow but certain decimation of many

of our best herds, the wholesale destruction of human food, and the danger, as is now proved, to human life and human comfort, and the insidious progress of that fell destroyer, tuberculosis, the ravages of which are only realised by those whose duties are connected with public abattoirs and meatworks, or are called upon to act as arbiters on the nature of the disease. It is an extremely sad commentary on these remarks that Professor Walley himself has died from tuberculosis, acquired several years ago by inoculation in connection with his profession.

The more we know about tuberculosis, the more alarmed we become at the appalling extent of this disease among cattle. In Denmark alone, during the last five years, Bang has tested with tuberculin upwards of 75,000 head of cattle, and of this number no less than 29,775 (39·7 per cent.) were found to be affected with tuberculosis, which will give a fair idea of what hold the disease has on the cattle of Europe.

Although Australia and New Zealand are not so seriously affected as the older countries of Europe, the returns from the abattoirs and meatworks under Government veterinary inspection, and the results of occasional examinations with tuberculin on stud and dairy cattle, show that the disease has obtained a foothold in these colonies, and is now causing considerable loss. When we consider what marvellous results Bang has achieved during the last five years by means of the free application of tuberculin test, in gradually eradicating tuberculosis from the dairy herds of Denmark, and the decisive action in France, Germany, and America, and recently in Great Britain, in their endeavours to stamp out tuberculosis, it is not unreasonable to ask the stock-owners of Australia to work in harmony, and co-operate in making a desperate crusade against what is universally acknowledged to be the most serious of all diseases in cattle—viz., tuberculosis—in the first place by the free and constant use of tuberculin, and secondly by using only that pleuro virus which has with-stood the bacteriological test. It is extremely gratifying to know that the demand for pure pleuro virus from the Stock Institute is considerably on the increase, and that the tuberculin test is gradually being taken up by the breeders of stud cattle and some of our dairy farmers, but, in order to make both systems perfect, we necessarily require some legislative action.

The study of bacteriology is so interesting and important, and opens up such a wide field for speculation and research, that I must be pardoned for having dealt with it in more detail than perhaps the compass of this address would warrant; but I trust that I have proved to you the stockowners' indebtedness to the microscope, and that all those marvellous and brilliant discoveries relating to the origin, nature, prevention, and treatment of bacterial diseases of our domesticated animals have been mainly brought about by the investigations of such brilliant epoch-making men as Pasteur, Koch, and Lister, whose names will ever be associated with the microscope, and remain as lasting monuments to the science of preventive medicine.

TEXAS FEVER.

INOCULATION.

THE following interesting letter has been received by Mr. P. R. Gordon, Chief Inspector of Stock, from Dr. J. Sidney Hunt, whose researches into the Texas fever, and the means of combating it, have attracted much attention in scientific circles:—

Re the bullocks "Larry" and "Tommy," belonging to Messrs. Edwards Bros., of Mackay, that were inoculated by Inspector Haylock with "virulent" blood from Hughenden that had been treated with camphor after the method of Dr. Wynne.

The fact that these bullocks had high temperatures after their inoculation might, I think, be accounted for in four ways—

1. That the blood was putrid, and caused some septicœmia. (No saturation with camphor will keep blood from putrefaction, as I have proved.)
2. That the blood may have contained a *toxin* (elaborated by the micro-parasites during the life of the animal from which it was taken), which might have produced a high temperature. But no temperature was produced in the animals so treated by Dr. Wynne, nor in those which I subsequently did to test his method.
3. That the fever following the inoculation was an accidental circumstance, and was genuine Texas fever communicated by ticks (if, as I think was the case (?), the bullocks were brought in from a clean place to an infested one at about the time the inoculation was done), is not improbable.
4. The camphor may have failed to destroy the life of the microparasites in the virulent blood sent down from Hughenden. If this were so, it was, to all intents and purposes, "virulent" blood.

The fact that these two bullocks have proved themselves immune to Texas fever excludes the first suggestion. For we have no evidence that an attack of septicœmia protects from Texas fever.

That their blood has been found capable of setting up the characteristic fever reaction and affording subsequent immunity in other cattle, negatives the second supposition. For though the injection of a *toxin* might very possibly produce immunity in the animal injected, the blood of that animal would certainly not be capable of setting up the characteristic fever reaction in other animals into which it was injected, and the blood of these again in yet others, as has been the case with Edwards' bullocks. Such action involves the presence of a living, multiplying organism—quite a different matter to the presence of a *toxin* or an *anti-toxin*. The question of these substances must therefore be excluded as having no special bearing in this particular case, as distinguished from all other cases where blood containing living organisms has been used for inoculating purposes.

If we accept the facts as stated, we are driven therefore to adopt the hypothesis 3 or 4—viz.: That they had an attack of natural fever from ticks, or that the organisms in the blood from Hughenden were not destroyed. I don't know how we can definitely decide between the two. If, however, we adopt the view that the organisms in the Hughenden blood were not destroyed by the camphor, there can, I think, be no reason for supposing that they were in any way *attenuated*, for the bullocks were reported to have had very severe attacks—quite as severe, I understand, as would on the average be produced in animals of their class by injection of blood from an acute case.

As regards the statements that all cattle inoculated from "Larry" and "Tommy" have proved immune, and that inoculation with their blood has caused no deaths, I would venture to suggest that we have heard of large herds being inoculated, without loss, from other cattle than "Larry" and "Tommy." But where the evidence is weak in all such cases is in the fact that the immunity of such inoculated cattle has not been crucially tested.

Inspector Haylock received instructions to test the Messrs. Edwards' cattle, by injection of virulent blood into a few head of their inoculated cattle, to ascertain whether their herd had been effectually inoculated or not, but I learn that as yet no report of such inspection has been forwarded to the Minister. I urged upon the owners about Mackay that such a test was absolutely essential where there was any room for doubt as to the efficacy or otherwise of the inoculations that had been done. And that if the cattle had been rendered immune it would do no harm, and, if they had not, the sooner the owners were aware of the fact the better it would be.

From what I have said you will see that I do not think the particular case in question has any special bearing on the subject of toxins or anti-toxins. Will you, however, please thank Inspector Haylock for his suggestion, and explain my view of the case to him? Perhaps if I am wrong in any point of local circumstance or detail he will kindly put me right.

Now that we have got upon the subject of toxins and anti-toxins in their connection with Texas fever, I will endeavour to give you a sketch of what I am now trying to do. I have rather shunned writing to you about it on account of the inevitable prolixity it involves.

The first two subjects have nothing to do with the toxin question, but I think I may as well mention them here.

1. I am endeavouring to ascertain if, by inoculating from bullock to bullock through a series of eight or nine, the virulence is increased as suggested in Tidswell's report. I injected A with recovered blood; and when he reacted (105 or over), B; and when B reacted, C; and so on—using in each case blood taken during the height of the inoculation fever. So far I have got to the seventh remove, *and I have not had one really severe case amongst the lot*, though they have each gone to 105 or over (maximum 106·4). There certainly is no evidence that the blood is becoming enforced in virulence by this continual transference.

2. The second point is to ascertain if blood taken during the height of the fever is after all so much more "virulent" than "recovered" blood. The weakest point in our present system is that "recovered" blood, whilst sometimes setting up excessive reaction, very frequently fails to produce any reaction at all. This leads to much disappointment and dissatisfaction. The blood taken during the height of the fever is certainly more uniformly reliable in producing reaction, and I want to ascertain if we can safely recommend blood taken during the fever set up by inoculation to be used instead of "recovered" blood. So far the results obtained at Westwood are very favourable. It has never failed to produce sufficient reaction, and has never produced a severe case. Haylock, at Mackay, informs me that he has, at my suggestion and with the consent of the owner, inoculated a dairy herd of thirty or forty head with virulent blood from a typical case of natural Texas fever, *and all recovered.* These results are in marked contrast to those obtained in my earlier work at Hughenden, where the conditions at the time were horribly unfavourable—an open yard without shelter in the middle of summer in a severe drought, and two miles to travel to water. I am now inclined to think that the conditions, rather than the methods adopted, may have been responsible to a large extent for the severity of the results in that experiment. Of a series of seven, inoculated consecutively from one to another at Hughenden, as you may remember, the first and the sixth of the series died, and the others were horribly ill.

I am anxious, if possible, to obviate the disappointments and failures, and remove the more or less haphazard sort of element which the uncertain and irregular action of "recovered" blood involves.

3. The third point I am working at is to find a means of controlling or counteracting the effect of virulent blood at pleasure—on the lines of "serum therapy."

With "virulent" blood as a sure inoculating agent in one hand, and such a controlling or counteracting agent in the other, we should be able to go to work on all classes of cattle with *certainty* and *safety*.

Now, I think there are perfectly good grounds for believing that an immune animal differs from a susceptible one essentially in the fact that it contains something in its blood which the susceptible one does not. This something protects the animal that has it. Let us for convenience call this something an *anti-toxin*.

A *toxin* is, as you know, generated by the vital activity of a micro-organism in a suitable medium—*e.g.*, living bullock's blood. An *anti-toxin* is generated (as Nature's antidote to the toxin), in and by the blood and tissues of the living

animal. In other words, a *toxin* is the poisonous product of a micro-organism; an *anti-toxin* is the protective product of a living animal to counteract it. The more toxin is introduced into an animal the more anti-toxin is produced to counteract it. So that the blood of an animal into which large doses of toxin have been introduced becomes very rich in anti-toxin—so rich that when injected into a susceptible animal it protects it, too, in a passive way from any toxin which may be injected into, or generated in, its blood. This is the *rationale* of the diphtheria anti-toxin treatment. An injection of this serum serves not only to protect for the time being a person exposed to the contagion of diphtheria, but, by counteracting the toxins produced by the diphtheria bacillus in a person actually infected with diphtheria, acts essentially as a curative agent.

The animal in which the anti-toxin is generated is said to be *actively* immune; the animal into which the serum of such an animal is injected is said to be *passively* immune. That is to say, he is immune only as long as the anti-toxin (which was manufactured in the body of the actively immune animal) remains in his system. When it is eliminated, he loses his immunity; passive immunity is, therefore, only a temporary affair, but, for practical purposes, one of the very greatest importance.

In some cases the serum of an immune animal is, as above described, *anti-toxic* only—that is to say, it only antagonises the toxins produced by micro-organisms. In other cases it is also "anti-microbic"—that is to say, it destroys the *micro-organisms* themselves. In the case of Texas fever, the serum of recovered animals can be only *anti-toxic*, because, as we know, it does not destroy the micro-organisms in the blood of such animals.

All this is, I am sure, quite familiar to you, but I have gone over it again, as it is essential to the plan I am trying to work out. If I am correct in assuming that the cause of immunity to Texas fever is the presence of an anti-toxin in the blood of recovered animals, then the *larger* the dose of "recovered" blood injected, the *less* should be the reaction produced; because the quantity of anti-toxin contained in a large dose of such blood would have some effect in counteracting the toxins produced by the microparasites introduced at the same time. The *number* of microparasites introduced at the time of the injection probably makes little difference, because, be they few or many, they will, from their power of multiplication, in a short time reach the possible maximum, which is determined by quite other factors than the number originally introduced. Hence a dose of 500 c.c. of *ordinary* recovered blood should produce less reaction than 5 c.c. of the same blood. I think, probably, it would produce no reaction at all, but would probably afford a passive immunity of short duration. I have never yet gone so high as 500 c.c., however, but intend shortly to do so. But for general use such large injections would be obviously impracticable. Moreover, they would be undesirable (if they were found to have the action indicated), because we desire to set up a certain degree of reaction which shall be followed by *active* and therefore lasting immunity.

If, however, we could find a means of very greatly enhancing the anti-toxic power of the blood of a recovered animal, so that a comparatively small quantity of it would have the same counteracting or protective effect, as I have suggested, of 500 c.c. of ordinary recovered blood, we should be able to use it as a means of regulating the reaction caused by inoculation with virulent blood —and perhaps also as a curative agent in the early stages of the natural disease.

The means by which I am hoping to obtain this more potent anti-toxic blood (we should be able to separate the serum and bottle it off for use as required, as is done with the anti-diphtheritic serum from the horse) is by repeatedly injecting into the jugular vein of a recovered animal very large doses of the most virulent Texas fever blood I can get. Beginning by injecting 100 c.c. of virulent blood into an animal that had completely recovered from the inoculation fever, I intend to repeat the injections at intervals up to 500 c.c. of virulent blood. And by this means I hope to enhance or enforce the anti-toxic value of its blood to a very great extent.

Whether I shall succeed in this, I, of course, cannot tell. It may seem to you all rather visionary; but most practical things begin that way, I think. Anyway, some observed facts seem encouraging: In the first place, 40 c.c. of ordinary recovered blood injected into ten bullocks early last year produced no marked reaction, and I have records of cases where much larger quantities have been injected. In one case an indignant owner wrote to me that recovered blood was no good because he had fairly pumped it into an old cow *ad lib.*, without producing any effect.

Then, again, as to an anti-toxin being present, though probably, in ordinary recovered blood, in quantities too small to be of much value when injected in practicable doses: I did thirty-two bulls for Mr. Archer last year on the same principle. I first sterilised recovered blood, and then injected 40 c.c. of it—in some cases at the same time that I inoculated them with ordinary recovered blood, in some cases a week before, and in some cases a week after. Only one of the thirty-two died. And though the work had to be done in such a way as to be of small value for experimental purposes, the results were more satisfactory than those obtained by Mr. Archer when inoculating the same class of animals in the ordinary way, so that the plan seems worth following into the developments I have suggested.

Using uniformly, for inoculation, blood taken during the acute stage of the fever, and injecting a standard dose for all animals alike, we should have an element of certainty in our inoculating material. And having in reserve an *enforced anti-toxic serum* to be used simultaneously with virulent blood, at discretion according to circumstances, we should be able to graduate the reaction at pleasure. For we do not, of course, desire in any case to completely counteract the effects of the virulent blood. If we did so, we should get no reaction and no active immunity in the animals treated. For instance, in adult bulls, we should inject a comparatively large dose of the protective serum at the same time that we inoculated them with virulent blood, because of their great susceptibility; in aged milking cows and fat bullocks, somewhat less; and for the ordinary run of young stock I do not think any protective serum would be necessary—they can quite well stand, under favourable conditions, inoculation with acute fever blood.

TEXAS FEVER.

THE following three articles on Texas fever were contributed to the *Breeders' Gazette*, Chicago, by Dr. D. E. Salmon, V.S., D.V.M., Chief of the Bureau of Animal Industry, Washington (U.S.A.). They contain in a short concise form a history of the means adopted in America to connect the ticks with Texas fever, and details of the most recent experiments in the direction of discovering an effective dip.

The official reports of the Chicago Bureau of Animal Industry not being available to general readers here, and there being many in the colony who would highly appreciate these articles, Mr. P. R. Gordon, Chief Inspector of Stock, Queensland, suggested the advisability of publishing them *in extenso* in the *Queensland Agricultural Journal* for the benefit of all interested in the tick question, and especially for the benefit of those who are still sceptical on the teachings of the Department of Agriculture on the subject.

TEXAS FEVER PROBLEMS.—I.

For many years Texas fever has been a serious obstacle to the development and prosperity of the cattle industry in certain sections of the United States. It has made the marketing of cattle from the infected district a menace to the cattle-owners of the remainder of the country, and its existence has been used as a reason for shutting American live meat out of foreign markets. A disease having so many possibilities for evil, and which is enzootic in a large section of

our country, remaining with us year after year with only a faint hope of eradication, necessarily presents problems of the greatest interest and importance.

When, about eighteen years ago, the writer was called upon to begin the investigation of this disease, it was considered advisable to learn, first of all, the exact location of the district in which the contagion, so much feared by the northern cattle-grower, originated. The definition of this district with approximate accuracy, and the demonstration that northern cattle taken into that district contracted the same disease as was disseminated in the north by southern cattle, made it possible to formulate those general problems which it was most essential, in the interests of the cattle industry, should be solved.

It has been said that when a problem is once clearly stated its elucidation is half-achieved, and, although this may not always be the case, it certainly is a long step toward the desired end. The great Texas fever problems were formulated substantially as follows:—

1. How may cattle be moved from the infected district to other parts of the country without endangering the stock of the localities to which they are taken?
2. How may cattle be taken from the non-infected parts of the country into the infected district without subjecting them to the great danger of contracting the disease and dying from it?
3. By what methods and to what extent may the area of the infected district be diminished?

As it was known that from 75 to 90 per cent. of the adult cattle thoroughly exposed to the contagion of Texas fever during the hot weather were likely to contract the disease and die, and as the contagion appeared to be mysterious and incomprehensible to an unusual degree, the hope of an early solution of these problems was by no means brilliant.

The first of the problems mentioned was most urgent, and a partial solution of it was reached in a few years. Knowing from observation that the infection does not spread beyond the grounds upon which the cattle from the infected district are allowed to travel, and that it is not dangerous in cold weather, it only remained to define accurately the infected district in order to be able to prevent the greater part of the infection of the cattle in the States above the fever district. To accomplish this the following measures were adopted:—

1. The infected district was placed in quarantine.
2. Cattle for grazing were allowed to come out of the infected district during the cold weather only, as at this season the infection does not spread.
3. Cattle for immediate slaughter were allowed to come out only on condition that they be moved by rail; that when unloaded they be placed in pens set apart for infected cattle; that they should not be allowed upon roads or streets used for susceptible cattle, and that the cars in which they were transported should afterwards be cleaned and disinfected.

Under these regulations the cattle of the infected district have been marketed for years without any serious loss in the Northern States from Texas fever. The stockyards of the country have become safe places to buy feeders at any time of year, and the old fear of the fever, as well as of the southern cattle, has largely disappeared. The hardship and loss were, however, to a great extent, shifted from the cattle industry of the north to that of the south. The northern feeder could only buy his southern stockers in the winter, but this was an inconvenience rather than a loss. On the other hand, the southern breeder was obliged to stand a loss on his quarantined cattle shipped for slaughter, and also to hold his stockers much later in the season than would otherwise have been necessary. The danger to cattle taken into the infected district to improve the stock continued, and the infection was unquestionably advancing into territory that had never before been affected.

This situation continued while the investigations of the disease were being pursued, and must have continued indefinitely but for this scientific work.

In the years from 1880 to 1882, inclusive, the writer made inoculation experiments with from twenty to twenty-five head of cattle, from which it was shown that the disease might be transmitted by hypodermic inoculation with the blood of animals that were suffering from it. Some of the inoculated animals died and others recovered. These experiments were the starting-point of the scientific researches. They indicated, first, that there was something in the blood of affected animals which would cause the disease; and, secondly, that it was possible to produce a mild form of disease in this manner from which the greater part of the animals would recover.

The next important step was the discovery by Dr. Theobald Smith, working under the writer's direction, of a parasite in the red globules of the blood of animals suffering from this disease. This minute micro-organism was first observed in 1886, and was carefully studied during the years 1888 and 1889, at which time the conclusion was reached that it was an important factor in the production of the disease.

About this time, probably in the latter part of the year 1888 or early in 1889, the writer happened to meet Hon. D. W. Smith, of Illinois, at a hotel in the city of New York, and, while at dinner, the subject of Texas fever formed the leading topic of conversation. Mr. Smith earnestly urged a thorough investigation to determine if the ticks usually carried by cattle from the infected district play any part in the production of the disease. He urged that the stockmen of his section were convinced by observation that the tick was in some way responsible for the infection, and he was strong in the same belief. This view as to the tick had been held for many years by some of the cattlemen of the south-west, but was at best only a conjecture, and was offset by equally strong convictions of others that the infection was disseminated by the saliva, the urine, the manure, and even the discharges from the sore feet of southern cattle. Mr. Smith advanced the theory that the disease might be caused by the small ticks, which were found on the grass in large numbers in the pastures where the southern cattle had been. He thought that these must be swallowed with the food, and might poison the system and produce the fever.

Scientific investigators had never been favourably disposed toward the tick theory. There was no precedent among the epizootic diseases which had been studied for such a theory, and it was thought that the characteristics of Texas fever were inconsistent with the conclusion that the infection was due to the ticks. The discovery of a parasitic micro-organism in the blood globules was also supposed to bear against the tick theory, because at that time it had occurred to no one that two entirely different kinds of parasites co-operated and were necessary to the spread of the disease.

There was, however, one fact which apparently had not been appreciated by others which strongly inclined the writer to the view that the ticks had something to do with the spread of Texas fever. When the infected district (that is, the district from which cattle carried the contagion) was investigated and mapped, it was found to correspond exactly to the district which was the habitat or home of the southern cattle tick (*Bo-ophilus bovis*). That this correspondence should occur over such a wide extent of territory, and that there should still be no connection between the parasite and the disease appeared to be one of the most remarkable coincidences observed in all Nature.

It was determined that all doubt in regard to this question should be speedily removed. To that end Dr. F. L. Kilborne, who was then superintendent of the experiment station of the Bureau of Animal Industry, was conferred with and instructed to carry through a series of experiments which would prove either that the tick was responsible for the spread of the disease, or that it was innocent of the charges which had been made against it.

The first experiment to decide this point was made early in the summer of 1889. Seven head of cattle from the eastern part of North Carolina were

shipped to the experiment station and divided into two lots. Four of these cattle with the ticks upon them were placed in one field with thirteen native animals. Of these native cattle ten, or 76·8 per cent., died with Texas fever. From the three southern cattle in the second lot, the ticks were carefully picked by hand on successive days until no more developed upon them. They were then put in a field with four native animals, none of which contracted the disease from them.

This preliminary experiment having resulted favourably to the tick theory, other similar experiments were made later in the same summer; and in all cases the native cattle exposed to southern cattle with ticks contracted disease, while those exposed to southern cattle from which the ticks had been carefully picked by hand remained healthy. A variation of this experiment was made the same year by placing some native cattle in a field to which no southern animal was ever admitted. In this field ticks picked from the southern animals were scattered over the grass. Three out of four animals in this field contracted Texas fever.

In the following year (1890) these experiments were repeated. It had been clearly shown that the ticks spread the disease, and the main points now were to ascertain how this was done and whether there was any other means of transferring the contagion. A further variation of the experiment was made by hatching in the laboratory the eggs of southern ticks and placing the young ticks upon native cattle, and it was thus shown that the young ticks are capable of producing the disease.

It is not necessary to go into details relative to the numerous experiments that were made to clear up the manner by which this disease is carried and spread. The facts bearing upon this aspect of the question will be briefly stated in order that the reader may have an intelligent understanding of the measures that are required in the way of prevention.

The large ticks which are seen attached to the skin of cattle are females. The males always remain small, about the size of a pin's head. The females become attached when small, mature rapidly during warm weather, and much more slowly in cold weather, are fertilised by the male, finally drop to the earth, lay their eggs and die. The males are said to drop from the cattle about the same time as the females, and to die within a day or two; though on account of their small size they are more difficult to follow, and there is less certainty in regard to them.

The females produce about 2,000 eggs, which are laid in the course of a week after they drop from the cattle. The eggs hatch in about three weeks in midsummer; in cooler weather four or five weeks are required; while if laid early in the spring they will not hatch until warm weather, even if several months intervene. The young ticks, although active, do not travel far, but climb up the first grass or herbage they encounter, and cling to any animal which brushes against them. When they get upon cattle they soon attach themselves to the skin, making a puncture and sucking blood for their sustenance. In from ten to fifteen days in summer after the cattle become infested with these young ticks the symptoms of fever are observed. In cool weather the disease develops more slowly.

Summing up the life history of the tick, it may be said that the adult females are mature and drop to the earth in three weeks or longer (according to the weather) after they get upon the cattle. The females are about a week in laying their eggs and then die. The young ticks hatch in three to four weeks in summer, and may live a long time, probably until cold weather, without food and without developing, if they fail to come in contact with cattle or other animals favourable to their existence.

These facts not only explained many of the mysterious features of Texas fever, but they indicated that by destroying the ticks upon the southern cattle the danger of spreading the disease might be removed.

TEXAS FEVER PROBLEMS.—II.

In the preceding article on this subject it was shown that Texas fever is transmitted from the southern to the northern animal by means of the cattle tick, and it is assumed, for all practical purposes, that this is the only way in which the contagion is disseminated under natural conditions. The disease may be produced by the investigator through the inoculation of blood, or in very exceptional cases a similar inoculation may be made by flies or other biting insects. That there is practically no danger of the contagion being carried by anything other than the tick is shown by the well-known fact that hundreds of thousands of southern cattle are taken north for grazing every winter without causing disease, although the micro-organism of Texas fever remains in their blood in a virulent condition during their whole lifetime. If flies or other insects were a frequent factor in transmitting the contagion, we should hear of numerous outbreaks of Taxes fever wherever cattle from the infected district are grazed upon the same ranges with susceptible natives. The absence of such outbreaks when ticks are not carried is the best possible evidence that they alone need be feared.

In the report on Texas fever prepared under the writer's direction and published in 1893, it was clearly stated that the results of the investigations therein made public bring up the very important question whether southern cattle "cannot by some means be freed from ticks so that their transportation may go on without any restriction during the entire year." Several methods for accomplishing this were suggested. It was stated that "cattle might be subjected to disinfecting washes of various kinds, or else they might be run through disinfecting baths which expose the whole body to the action of the liquid used."

Other methods, frequently discussed in conversation but which were not mentioned in the report, are the application of the tick-killing liquids with brushes or mops or with a spraying apparatus. These last-mentioned methods were discarded as too slow and inefficient. However, spraying is used considerably in South Africa, and mops and brushes are often found convenient in this country when but a small number of animals is to be treated. The plan of submerging the animals in a dipping-vat filled with the selected liquid is, however, unquestionably the only safe and satisfactory method for treating animals that are to be shipped for grazing purposes. Substances sprayed or rubbed upon the animals are not so irritating in their effects as when used in the vat, but it is nearly or quite impossible to reach all of the ticks in the folds of the skin, and particularly between the legs. The conclusion was therefore reached that dipping is the only practical method of destroying the tick.

Having decided that the ticks must be killed by dipping the cattle, the next question to be solved was the composition of the liquid which should be used. This minor problem, which at first sight appears very simple, has really given as much trouble as any other question connected with the disease. The ticks were first experimented with in the laboratory, and it was found that the ordinary insecticides, poisons, and mineral acids even had little effect upon them. They had a greater power to resist such substances than was possessed by the cattle. For a long time the prospects of finding a tolerably efficient dip were very discouraging.

The first person to build a vat and to dip cattle appears to have been Mr. R. J. Kleberg, of Santa Gertrude's Ranch, Texas. His cattle were dipped in a strong solution of carbolic acid as treatment for mange, and he observed that many of the ticks dropped off or died soon after the dipping. As the results of the investigations of the tick as the carrier of the Texas fever infection were fresh in Mr. Kleberg's mind, he informed the department of his observation and placed his dipping-vat and his "ticky" cattle at the disposal of the Bureau of Animal Industry for further experimentation. An inspector (Dr. Norgaard) was stationed there, who gave his whole time to this question and tested a vast number of different mixtures. Some of these dipping solutions killed a portion of the ticks and caused severe inflammation of the skin of the

cattle; others did not injure the cattle, but had little effect upon the ticks. Some would kill the greater part of the ticks in winter, but would not do nearly so well in summer. During the years 1894 and 1895 more than 20,000 ticky cattle were dipped, but none of the dips used would kill all of the ticks without injuring the cattle so seriously as to make them inadmissable for general use.

Dr. Francis, of the Texas Experiment Station, deserves credit for first experimenting with an oil dip. While the crude cotton-seed oil which he employed did not kill all of the ticks, either when used alone or with the addition of as much carbolic acid as the cattle could bear, it was nevertheless a step in the right direction. Dr. Francis also experimented with crude black mineral oil. Both of these oils were too heating in their effects upon the animals. The oil and carbolic acid and the black mineral oil caused extensive and serious inflammation of the skin and eyes, and failed to kill all of the ticks.

Dr. Norgaard, who was stationed at the Santa Gertrude's Ranch, and later at Fort Worth, experimented with a great variety of oils, emulsions, solutions of soap, &c., and concluded that a lighter kind of mineral oil, called "paraffin oil," was most efficient. The irritation of the skin caused by this oil was slight, and no heating effect was apparent. After being dipped in crude cotton-seed oil, or black mineral oil, the cattle would pant or breathe heavily, and show all the symptoms of suffering from extreme heat, even when the atmospheric temperature was not above that of ordinary spring or fall weather. This was a great disadvantage with cattle that were to be shipped at once, or driven, particularly in summer.

The paraffin oil is a lighter product than the black oil, the volatile irritating constituents having been distilled off, and this residue, which is generally used for lubricating purposes, should be neutral, bland, and soothing to the skin. Although this oil was more efficient as a destroyer of ticks than any substance previously used, it was still found that some of these parasites survived, particularly the small ticks that were almost ready to moult. Notwithstanding this fact, the result was such as to make it evident that this oil must form the basis of the coming dip.

Just at this point in the investigations the dip was a subject of much anxiety and long-continued study. Success was so nearly attained that we could not endure the thought of failure, and yet just enough ticks managed to escape destruction to compel us still to hold the cattle as dangerous. In considering how the efficiency of this oil might be increased, it was always necessary to bear in mind the three essentials of a successful dipping mixture: first, it must kill all of the ticks; secondly, it must not seriously injure the cattle; and thirdly, it must be of moderate cost.

By experimenting with this oil it was found that, when hot, it would dissolve a considerable quantity of sulphur, and that this combination of oil and sulphur was much more destructive to the ticks than the oil alone. Previous to this time the oil had been used in the form of a layer about 1 foot deep floating upon water. That is, as a matter of economy the dipping-vat was nearly filled with water, and 1 foot of oil was run in upon the top, where it remained on account of being lighter than water. The theory was that the cattle, as they dropped into the vat and were submerged, would go entirely through the layer of oil and in coming out they must go through this oil a second time, thus making it certain that all portions of the skin would receive a coating. Observations showed, however, that in dropping the cattle into the liquid a great splashing and mixing of the oil and water was caused, which led to some parts of the surface of the body being saturated with water before they were touched with oil. As a natural consequence, very little oil adhered to those parts where the hair was first filled with water. It was therefore decided that the vats must be almost entirely filled with oil, and that not over 1 foot of water could be permitted in the bottom of the vat. A small quantity of water is useful for collecting the dirt and excrement which finds its way into the vat in considerable quantities, and which, when it settles to the bottom, may be drawn off without wasting the oil.

The Fort Worth Stockyards Company placed its vat at the disposal of the bureau, and the first experiment in accordance with these new ideas was made at that point. To be brief, it was found that the oil and sulphur mixture, with no water in the vat, was entirely successful, and that all of the ticks were killed at a single dipping. The mixture appears to have more than a mechanical action; it penetrates the tick's body, causes it to dry and shrivel, and transforms it into a hard, brittle substance.

Dipping, according to this method, has been in operation during the past season at Fort Worth, Tex.; Mammoth Springs, Ark.; and at East St. Louis, Ill., under the supervision of the Bureau of Animal Industry, and in Oklahoma under the direction of the live-stock sanitary authorities. As is usual in the early stages of a new enterprise, so different from anything previously practised, there have been unexpected losses. These losses have not been so heavy as to injure the prospects of this method of treating southern cattle, but they have been heavy enough to indicate that greater care in handling the animals and some improvements in details are desirable. These will unquestionably come, as those engaged in the dipping are familiarised with the requirements.

The first lot, consisting of 311 steers, was dipped at Fort Worth on the evening of 22nd July, 1898, and was shipped for Rockford, Ill., at 4·15 the following morning. Some of the cars appear to have been too crowded, considering the heat which was then prevailing. When the train arrived at Denison, Tex., at 8·30 a.m., the cattle exhibited no inconvenience from the dipping other than a slight inflammation of the eyes, and those in cars loosely loaded were lying down and ruminating. Many of the ticks had already dropped off, and those remaining showed no signs of life.

As the heat increased many of the animals began to suffer, and by noon some were panting with the head down and tongue protruding. The irritation of the eyes was aggravated, and the thin parts of the skin on light-coloured animals showed redness. By 4 o'clock the heat was intense, and some of the animals were prostrated. At 6·30 three were dead and six unable to stand. The ticks were dark in colour and all dead.

During the night, as it became cooler, the cattle became more comfortable, though some were so exhausted by the heat of the day and the slippery condition of the cars that they would not remain standing, and consequently were bruised by trampling. They were unloaded at Parsons, Kan., at 3 a.m., 24th July, where five dead and four "downers" were left. They were again unloaded at Sedalia, Mo., at 6 p.m., where there were three more dead and one "downer." Upon reaching Galesburg, Ill., 10 p.m., 25th July, they were again unloaded and three "downers" were left. They reached their destination, Rockford, Ill., at 9 p.m., 26th July, the unloading not being completed until 12·30 a.m. of 27th July. There were four "downers" on this last run. Of the 311 head loaded 295 arrived at Rockford, four being down and all stiff and sore. The losses were principally due to the extreme heat of the first day's travel.

These cattle were visited and inspected 24th to 27th September, when both the southern animals and the natives with which they were pastured were found healthy. There were no ticks upon any of the animals, and the parties in charge reported that no living ticks had been discovered. The southern cattle showed a marked improvement over their condition before dipping.

At Mammoth Springs, Ark., 623 animals in all were dipped, the loss being two calves drowned in the vat and nine calves which died after dipping. This lot of nineteen calves were emaciated and affected with diarrhœa before dipping, and should not have been allowed to go through the vat. The remaining cattle did well, and the ticks were all destroyed. Here, also, the oil irritated the skin and eyes of the cattle more or less, but not to such a degree as to prove a serious objection to the dipping.

TEXAS FEVER PROBLEMS.—III.

The losses with the first shipment of dipped cattle to Illinois unfortunately did not cease when the animals reached their destination, but continued for some time afterward; and according to information furnished by Mr. C. P. Johnson, Secretary of the Illinois State Board of Live-stock Commissioners, the total reached thirty-two head.

A second lot of about 190 head of yearling and two-year-old steers were dipped at Fort Worth, Tex., 24th September, for the same gentleman that shipped the first lot, Mr. B. B. Page, Rockford, Ill. These were immediately loaded in well-bedded cars and shipped to Rockford. They reached Galesburg, Ill., in good condition; not a single animal had been down up to that time. At Aurora, Ill., an apparently inexperienced train crew was put in charge, and instead of making the run from there to Rockford in two or three hours they were ten hours on the road. The train was handled very roughly, with continual switching and sudden starts and stops, throwing, bruising, and exhausting the cattle, which were already very tired from their long journey. As a result nine head died before reaching destination, and others were severely injured. The living cattle were seen by Dr. Norgaard, 10th October, when twenty-four head had died, and a number of those remaining were stiff, and the skin of these was peeling off over the neck and shoulders. Some were still suffering from irritation of the eyes, and only a small percentage were entirely unaffected. The ticks were all destroyed.

In examining the sick and dead animals the State Veterinarian discovered the very interesting and important fact that they all suffered from acute Texas fever. This conclusion was confirmed by an examination of specimens afterward sent to the Bureau of Animal Industry by Mr. Page. The total loss out of this shipment was twenty-six head.

On 4th November, there were dipped at National Stockyards, Ill., 151 head of cattle in one lot, and seventy-two calves in another lot. Both of these lots afterward developed considerable irritation of the skin, and by 14th November there had been lost fifteen head of the larger lot and eight head of the calves. Dr. J. W. Connoway examined the calves, and found that they were affected with acute Texas fever.

Another lot of cattle which suffered severely was dipped at Fort Worth, Tex., 13th September, and taken to Midland, Tex., where they arrived in apparently good condition. There were 110 yearlings and two-year-olds in this bunch. The weather was very warm, and four days after dipping two yearlings were found dead. The fifth day one was dead and several sick, and the sixth day two dead. At the end of three weeks twenty-four had died.

Secretary Edwards, of Oklahoma, informs me that from 9,000 to 10,000 head have been dipped in that territory with an estimated loss of from 100 to 125, confined to cattle in poor condition. There have been dipped at Fort Worth, Tex., about 1,500 head, in addition to the Illinois shipments, and it is reported that losses have only occurred in two lots. One of these has already been referred to as going to Midland, Tex.; the other appears to have been a large bunch that went to the Indian Territory and gave rise to the alarming Press reports recently published. It was at first stated that fifty head had died, but investigation reduced this number to four. The remainder were said to have been injured, and more may have died since reports were made.

The aggregate results of the year's dipping would appear to be about 12,000 dipped, with a loss of about 240 head. This is equal to 2 per cent., and if the injury to those which survived has not been permanent or has not interfered materially with their subsequent gain the method would still be of great value. It has always been asserted by southern cattle-dealers that from 2 dollars to 3 dollars a head were lost on "quarantine" stock because it does not have a free market. If we admit that the dipped cattle have an average value of 35 dollars, a loss of two out of each 100 would equal 70 dollars, or about 71½ cents for each animal remaining alive. The other expenses of dipping might increase this to about 1 dollar per head. If the statements as

to the loss on cattle on account of the quarantine have not been greatly exaggerated, there would still be a profit of from 100 to 200 per cent. in dipping.

These losses from dipping were, however, entirely unexpected, and especially those from the development of acute Texas fever. It is another illustration of the fact that if people will rush too rapidly into new things they must expect to pay something for their experience. The writer has endeavoured to hold back the enthusiasts until the method could be placed upon a secure experimental basis; but they would not have it so, and as a consequence the Government will be relieved of some of the expenses which it would otherwise have been obliged to incur for these investigations.

A very interesting question just at this time is: Will it be possible to reduce materially this loss of 2 per cent., which has occurred this year, by greater care or by improving the method? This question may be safely answered in the affirmative. An improvement may be expected by attention to details in at least four directions. First, the cattle should be reasonably strong and vigorous, or they should not be dipped. If this rule had been followed there would have been no losses at Mammoth Springs, and a much smaller number would have been lost in Oklahoma and Texas. Secondly, if the temperature is extreme the cattle should be allowed a few days' rest after dipping, with shade or shelter before driving or loading upon cars. The dipped cattle suffered severely from the heat in midsummer, and equally as much from the cold which prevailed at the time of or immediately after the later dippings. Thirdly, it appears that some of the dipping vats might be improved so that the strain and shock would be considerably reduced. Fourthly, there is a prospect of improving the dipping mixture so that the irritating effect upon the skin and eyes of the cattle will be reduced or entirely prevented without impairing its tick-destroying properties. All of these questions are receiving very careful study, and no means of perfecting the process will be neglected.

If the loss and damage which has occurred serves to convince cattlemen of the necessity of careful Government supervision of all dipping plants, and of the importance of some care and judgment upon their own part, the reverses which have occurred will inure to the benefit of the public. It looked a few weeks ago as though there would be as great a rush to establish dipping plants for cattle as there was a few years ago to secure real estate in Oklahoma, or more recently to exhaust the gold deposits of the Klondike. Now that the brilliancy of the prospects for securing immediate fortunes by conducting a dipping station has been somewhat obscured, perhaps it will be possible to limit the number of these stations, if not to the actual needs of the country at least to the inspection resources of the Government.

The development of acute Texas fever in dipped cattle, though unexpected, is not entirely inexplicable. It is well known that the apparently immune cattle of the infected district carry in their blood the microscopic parasites which constitute the contagion. They have the power in some unknown manner to hold the parasite in check and prevent it from rapidly destroying the red globules of the blood. But this immunity may be lost by the depletion of the animal's force and vitality, and, the restraining influence being no longer sufficient to control the parasite, this organism multiplies rapidly, exerts its destructive influence upon the red globules, and soon causes the symptoms of Texas fever.

It has frequently been observed that when southern cattle were driven long distances or exposed to extremes of temperature or otherwise prostrated they have been affected with Texas fever. Emaciated and unthrifty yearlings taken north late in the fall, and exposed without protection to cold winds and rains, are particularly subject to it. If, now, to the fatigue of long shipment and the change to a cooler climate there is added the shock, the cooling effect, and the irritation of the skin which follows dipping, there is no reason for surprise if the number of cases of fever which develop are greatly increased.

The thing to do is evidently to reduce these prostrating influences to a minimum, and this will be rapidly accomplished. A prospective gain of such magnitude as there is in sight through this operation will not be allowed to elude the American people much longer when complete success has been so nearly achieved. With the lessons of the past season for our guidance, the improvements suggested in this article will be greatly facilitated and hastened.

Until the process has been perfected and satisfactorily proved by experiment, it is well that cattle-owners should not be too rash in dipping their animals. The dipping is now a practical success and will be continued, but the man who risks all the cattle he owns at one dipping, or who dips cattle that are poor, weak, and already exhausted, is, to say the least, injudicious. Persons inclined to take such chances should remember that the Government is not responsible for any damages which may occur, and that the prospects of recovering from the owners of the dipping plant will not justify the risk.

General Notes.

STRAW ENVELOPES FOR BOTTLES.

As the manufacturing industries of Queensland are yearly on the increase, many of them involving a demand for protective coverings to bottles of various descriptions, it becomes an interesting question whether these coverings, especially the well-known straw envelopes, could not be profitably produced in the colony.

During the course of last year the attention of the Department of Agriculture was drawn to an official report by H.M. Consul at Bordeaux, in which a paragraph occurs relating to the manufacture of these straw envelopes, which is quoted as an important item of trade.

The possibility of this industry being entered upon in Queensland induced the Department to make inquiries in Europe on the matter, and the Agent-General was asked to inquire fully into it, and to obtain all the requisite information as to mode of manufacture, machinery necessary, cost of production, &c.

The report above referred to says:—"In basket work is included the important item of straw envelopes for bottles, of which over 7,000 cwt. were shipped to England by the general steam navigation company's steamers alone, while large quantities were also exported to Newhaven, Bristol, Glasgow, Liverpool, and Hull by the lines. They are made by hand and by special machinery, and the price, delivered on the Bordeaux Quay, is from 12 fr. 50 c. to 14 fr. 50 c. (10s. to 11s. 8d.) per 1,000."

Full information was subsequently received from the Agent-General, of which the following is the gist:—

The envelopes are made in many parts of France, especially, however, at Bordeaux, by Messrs. G. and J. Lacour Bros., who make them on their own machinery. They are also largely manufactured in asylums and prisons, the asylums for the blind being large producers.

In the Netherlands (Holland) the manufacture is carried on at six or seven factories. These are situated at Eindhoven, Gröningen, Arnhem, Costerhout, and Vricht, and envelopes are also made by the inmates of the prison at Hoorn.

The straw of which they are made naturally varies in price, according to the produce of grain. Long clear straw is valued at from £2 to £2 5s. the ton, and short kinds at from £1 to £1 10s., whilst the cuttings from the factory are a source of revenue, realising about 15s. the ton as waste.

The manufacture embraces four processes:—

1. Cutting of the straw.
2. Sewing it together.
3. Binding on a wooden, bottle-shaped last.
4. Cutting off uneven ends.

This is chiefly done by girls and children, the heavy work, such as cutting, loading, unloading the straw, and pressing the wrappers into bales, being effected by men.

WAGES.

The wages earned by the workpeople do not appear to amount to what would in this colony be called a "living wage." The machines are worked by girls who receive from 2s. to 4s. 8d. per week, when employed on the small machines, whilst for working the large ones the highest rate is 5s. 1d.

The binding and cutting are done by boys and girls, whose wages range from 2s. 6d. to 6s. 6d., and men earn about 8s. weekly.

In a factory where the machinery is driven by steam and some hundred hands are employed, the foreman, the engineer, and the overseer earn, respectively, about 16s. 8d., 15s. and 11s. 3d. a week

PRODUCTION.

Such a factory can turn out from 40,000 to 42,000 envelopes daily, but this is said to be an extreme figure, and it may be safer to assume an annual production of about 7,000,000 for the year as the more correct output—that is, about 23,000 daily.

At Hoorn, the production amounts to between 4,500,000 to 5,000,000, whilst the total annual production in the Netherlands is estimated at 25,000,000.

COST OF PRODUCTION.

According to the evidence of a manufacturer who appeared as a witness a couple of years ago before a Departmental Committee appointed to inquire into the competition of prison-made goods, the initial cost of 1,000 wrappers manufactured by him amounted to 3s. 8d., against 1s. 5½d. charged in the prison at Hoorn, to which has to be added the cost of the raw materials (which for the reason above stated is naturally subject to variations), resulting in the prime cost reaching 10s. per 1,000.

Owing to the aforesaid competition of prison-made goods, the manufacturer could not realise a better price than 9s. 10d.; and he added that, from personal investigation in London, it appeared that the owner of the goods made at Hoorn had an agent at the former place who offered them at a much cheaper rate than the witness could sell at. It appears evident, therefore, that whereas the manufacturer loses money, the prison-made wrappers leave a fair if not a substantial profit.

The fact, however, of this manufacturer not being able to make the business pay, need in no way act as a deterrent to the introduction of the industry into Queensland, for reasons which will commend themselves to parents with large families of girls, and to manufacturers who carry on business mainly by the work of the youth of both sexes, whether as apprentices or as weekly paid labour. We understand that one enterprising firm has imported a hand machine into Brisbane, and the industry has thus already commenced.

MACHINES.

Two kinds of machines are used—one worked by hand, and the other by steam or by foot, similar to the action of the sewing-machine. The price of machines varies; for instance, the price of "La Bordelaise," packed at the railway station or on the quay at Bordeaux, is 2,800 francs (about £112). "The Modèle 1897" costs 600 francs (£24).

The necessary tools—including a straw-cutter, a winder, a key, and packer—add 600 francs (£24) to the cost of the machine.

Plate XCII.

BLIND BOY WORKING THE STRAW ENVELOPE MACHINE.

Our illustration shows a blind boy working Messrs. Lacour Bros.' straw bottle case machine "Modèle 1897."

The straw is doubled over at the bottom and cut off at the top end of the envelope, and is made to tightly fit over the bottle for which it is required. It is tied securely at the neck and laced with jute or hemp twine at one or two places, according to the length of the bottle.

The material considered best suited for the envelopes is hand-threshed rye straw.

The machines are so simple in construction and easy of manipulation that any handy girl or boy can work it.

A machine worked in a practical way can turn out 1,000 envelopes in a day of ten hours; when worked by steam power there should be five machines brought into operation, which, if worked for 300 days in the year, should easily turn out 1,500,000 envelopes.

It is on this quantity that the following statement is based:—

	£	s.	d.
1. Consumption of straw, 150,000 kilos (about 148 tons), of which 20 per cent. is waste, and is sold for chaff, bedding, and manure; at 5 marks (5s.) per 100 kilos, the cost of the straw amounts to M. 6,000... ...	£300	0	0
2. Twine consumption—taking jute as the best and cheapest, 2,250 kilos are required at 56 pfennings per kilo	63	0	0
3. Consumption of wire for packing in bales	6	0	0
4. Labour wages: 8 girls (where 5 machines are used) at 1·20 M. (1⅕ shillings per day), 9·60 M.; 1 man at 2 M. (2 shillings) per day, 2·00 M.; or a total for 300 days of M. 3,480	174	0	0
Taking the cost of the five machines, fittings, and apparatus generally at £225, an allowance for depreciation of 10 per cent. annually must be made of	22	10	0
The total working expenses will thus amount to ...	£565	10	0

The rent of premises and sale of straw waste appear to about balance each other. So that to produce 1,500,000 envelopes the cost would reach about 7s. 6d. per 1,000.

The cost of production must, however, be modified by the locality, relative cost of materials, price of labour, rent of premises, and so on.

The selling price varies in Germany from 6s. to 13s. per 1,000, according to the quality of the article; and this long range in price may be partly also accounted for by the mode of exportation adopted.

For instance, great glass bottle works, like those of Gerreshein, near Düsseldorf—which do an immense export business in glass bottles to England and Canada for wine and spirit merchants, brewers, distillers, and aerated water manufacturers—make the envelopes themselves; and as they can be used over and over again, freight is thus saved, whereas the manufacturers who export in bales will have high freight charges by reason of the bulk being so high in proportion to the weight.

There are no published statistics as to the extent of the trade in Germany.

The business would pay best in purely agricultural parts of the country, where materials and labour are cheaper than in the towns; and as it appears there is not much skill required in view of the small capital necessary, very useful employment might be afforded to destitute women and orphans in connection with charitable institutions, and it would also appear to be quite a legitimate branch of prison labour.

It will naturally strike the reader that the labour question would be a fatal stumbling-block to the introduction of the straw envelop business in Queensland; but as in the case of millet-broom making, it is a trade which may be

carried on in the family without any outlay for wages, where there are so many cases of members of it being temporarily out of work. No extra rent would be required, while straw is far cheaper here than in Europe. Furthermore, the price per 1,000 here would be higher than in France, Holland, or Germany, and where perhaps no profit, or possibly only a very small one, exists under conditions obtaining in those countries, the small margin might in the colony be converted into a reasonable profit, providing fair wages for a family's labour. At all events, the matter is one well worthy of the attention of practical men.

REMEDY FOR SNAKE-BITE.

WHILST India holds the record for deaths from snake-bites, Australia, with its many venomous snakes, has little to complain of in this respect. The most dreaded reptile of India is the cobra; that of South America, especially of Demerara, is the Bush-master, and in no less degree the Fer-de-Lance. The United States of America are, in certain zones, afflicted by the rattlesnake. Egypt has its horned adder. Queensland's poisonous snake world is represented by the black, brown, diamond, tiger, and a few more deadly reptiles, of which one of the deadliest is the deaf (or death) adder. But Queensland boasts a singular immunity from deaths by snake-bite. What is the reason for this immunity? It lies in this. The snakes mentioned, with the exception of the brown snake and tiger snake, are not aggressive. Again, their venom fangs are shorter than those of other tropical countries. Hence, some people who have been bitten by our venomous snakes have recovered under proper treatment. It would be interesting to be able to present a table of recorded deaths and recoveries from snake-bite in this colony, as is done in India.

Various remedies have been employed to counteract the effects of an attack by venomous snakes, and usually with success when the remedy could be at once applied, but it occasionally happens that a person is bitten when working far away from medical or domestic help, and such cases often end fatally. We are only too glad to publish any remedy which presents an element of successfully competing with the effects of snake-bite, and here we have one which appears simplicity itself. We give it as we have received it, for what it is worth. The letter is written to the *Florida Agriculturist*:—

Dr. F. E. Brown, in a late issue of the *Leesburg Commercial* (U.S.A.) gives a cure for the bite of rattlesnakes, which he says he has used successfully in his practice. We reproduce in full his letter, which may at some time prove of value to some of our readers:

Seeing in your paper a notice of the death of a lady from the effect of the bite of a rattlesnake, it occurred to me that it would be the proper thing to do to give you my experience with the tincture of iodine in these cases. I have treated thirteen cases of snake-bites in my practice with simply marvellous results—even restoring to life and health when the patient was supposed to be dying. My first case occurred many years ago. A little child, say three or four years old, was brought to me with two ugly gashes on the instep by a fair-sized rattler. I suppose I saw the child about an hour after the bite, with limbs badly swollen and in great pain. I applied iodine to the wound, and gave the child drop doses every ten minutes for an hour, then every half-hour until decided improvement. The child took 10 to 15 drops in all. Next morning the father reported child perfectly recovered and playing around as usual. My last case was about one year ago. A lad about fifteen years old, whilst reaching under some boards for hen-eggs, was bitten on his right hand by a large rattler. He was brought to me with hand and arm enormously swollen, and scarcely able to stand on his feet. I pursued precisely the same treatment as in my first case, except that I doubled the dose. He took in all perhaps 25 drops of the iodine. He recovered rapidly with no outward results. Some of my cases were much more remarkable than these; each one recovering quickly with no suppuration of the wounds or other outward results.

It is equally efficacious in the treatment of dumb beasts. A neighbour of mine had a cow bitten, which when found was unable to stand. I supplied the owner with iodine, and advised him to go back and drop 10 drops upon her tongue every ten minutes for an hour, then every hour for a time. He did so, but came back in an hour or so and reported that it was too late, as the cow was nearly dead. In the morning he went back to see what had become of his cow, and to his surprise found her up and feeding. Her recovery was rapid.

To your readers this may seem quite incredible, but they have only to try it in case of an accident of this kind to verify the facts stated.

LIME FOR TURNIPS.

If fresh slacked lime is worked into land to be sown in turnips, at the rate of between 40 and 50 bushels per acre, a month before sowing the seed, the trouble known as finger-and-toe will be completely overcome. The effect of the lime will be felt for some years afterwards.

PURIFYING LOW-GRADE BUTTER.

From one of our exchanges comes a rather startling piece of information, having reference to an entirely new process of purifying butter. A party of London gentlemen interested in the butter trade, and also a few analytical experts, journeyed to Dublin recently to examine at the invitation of the patentees, the Globe Trading Company, a new method of treating butter of low-grade qualities, by which it is claimed the article will be cleaned of all impurities, and made of first-class quality. The demonstration was given at the Irish Aerated Butter Company's Works at Blanchardstown. The process is started by all the butter being melted down into an oil in a large hot-water jacket tank, and when in this condition spray at 120 degrees Fahr. is turned on the oil. Afterwards the butter is drawn off, and put in circular tanks and mixed with buttermilk by being violently agitated. It is passed through other vats and aerated. By a power-exhausting apparatus air is drawn up through the oil, so that it bubbles as if boiling. When this operation is completed, the butter is claimed to be of fine texture and grain, and quite equal to the best. The demonstration given before the London gentlemen interested them very much, and several noted analysts gave it as their opinion that the process would revolutionise the trade. Not only were the grain and texture improved, but objectionable impurities, odours, taints, &c., are removed.

POISONING BY KAFIR CORN.

In October last we made mention of a case of reputed poisoning of stock, owing to the animals eating Kafir corn. We have just received a communication from Messrs. Harding Bros., of Geraldton, to the effect that two of their horses had lately died from the effects of that fodder.

Mr. W. C. Harding says:—"Two of our horses got into a patch of Kafir corn just bursting into bloom. This was on a Wednesday night. On the following Saturday evening one of the horses died, and the other succumbed early on Sunday morning. These horses were running in the same paddock and were grazing under similar conditions as two other horses. These latter are in perfect health, but they ate no Kafir corn. The usual symptoms of poisoning were exhibited by the animals, so that there could be no possible doubt as to that being the cause of death, and the surroundings point with strong probability to the Kafir corn as the primary cause."

We have consulted Mr. F. M. Bailey, F.L.S., Government Botanist, on this subject, and he gives it as his opinion that the horses were not *poisoned* by eating the corn, but possibly had over-eaten themselves, and were affected by "hoven." He says that there is no such a thing as a sorghum possessing poisonous qualities, and indeed no true grass of any description is poisonous.

Wheat and maize and many grasses are subject to "ergot," which is extremely poisonous, but no active poisonous principle exists in them or in any of the sorghums. Possibly the Kafir corn may have been so affected, but Mr. Bailey is not prepared to say that ergot is found on sorghums.

There is a weed which grows in the wheat and maize fields all over the colony called *Lolium temulentum*, more familiarly known as the "Drunken Darnel." This is the tare mentioned in Scripture, although properly speaking it is not a tare at all. This plant is poisonous, and Mr. Bailey says it is probable that the horses which died ate some of this.

We shall be glad to hear from anyone who has lost stock in consequence of feeding on Kafir corn, but so far there is no conclusive evidence that the deaths recorded have arisen from this cause.

RUNNING AN APIARY FOR WAX ALONE.

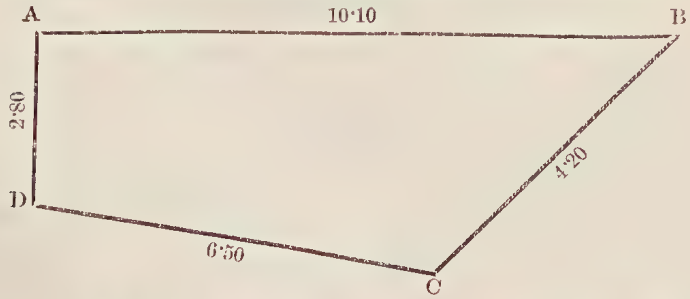
Recurring to our previous remarks on this subject, arising out of a communication to the *Journal of the Jamaica Agricultural Society*, we note that that journal quotes from Simmins' book, "A Model Bee Farm," as follows:—"To produce wax in quantity, a colony must be run for extracted honey, and at suitable intervals alternate the combs of brood or stores with starters only in the frames. Between the stored combs, these would be built rather thin, but the sealed combs are to be removed and the honey extracted as soon as the new ones are built to about two-thirds of the frame capacity, other empty frames taking their place, and so on in rotation. This process cannot be carried on to any great extent between brood combs, except as described for spring work or where a young queen presides over the colony, otherwise some drone comb will be built, and the production of useless drones shows a great defect in management."

TO MEASURE AN IRREGULAR PIECE OF LAND.

In the case of a four-sided field, each of the sides being of different length, a surveyor would commence by running a line which would divide the field into two triangles, and would then calculate their area by a mathematical process unintelligible to most working farmers. We can show, however, that any man who can add and multiply may reckon up the number of acres in any four-sided field without recourse to either surveyor or trigonometry.

We will suppose a field whose four sides are respectively, 4·20, ($4\frac{1}{5}$), 6·50 ($6\frac{1}{2}$), 10·10 ($10\frac{1}{10}$), and 2·80 ($2\frac{4}{5}$) chains in length, as shown in the diagram—

First, add the two opposite sides together, and divide by 2—



$$A\,B + C\,D = 10{\cdot}10 + 6{\cdot}50 = 16{\cdot}60 \div 2 = 8{\cdot}30.$$
$$A\,D + B\,C = 2{\cdot}80 + 4{\cdot}20 = 7 \div 2 = 3{\cdot}50.$$

Now multiply these two results together—

$$8{\cdot}30 \times 3{\cdot}50 = 2{\cdot}90500.$$

Cut off 5 figures from the right. (Note that in ordinary decimal multiplication four figures would be cut off.) We have now—

2·90500; or 2 acres and a fraction.

To find the roods, multiply the decimals (not the 2) by 4, and cut off five figures—

(2.) ·90500 × 4 = 3·62000; or 3 roods and a fraction.

To find the perches, multiply the decimal figures by 40, and cut off the five decimals—

(3.) ·62000 × 40 = 24·80000; or 24 perches and a fraction.

If the square yards are required, multiply by 30·75, and cut off seven figures—

(24.) ·80000 × 30·75 = 9·2250000; or 9 square yards.

And for the square feet, multiply the decimals by 9, and cut off seven figures—

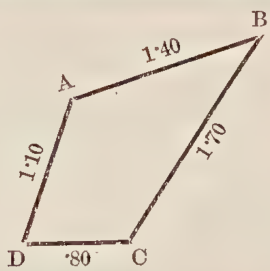
(9.) ·2250000 × 9 = 2·0250000; or 2 square feet.

Thus we have found our field to contain—

2 acres 3 roods 24 perches 2 square feet.

Now, let us take the case of a town allotment: The diagram gives us, as the length of the respective four sides—1·70 ($1\frac{7}{10}$), 1·40 ($1\frac{2}{5}$), 1·10 ($1\frac{1}{10}$), and ·80 ($\frac{4}{5}$) chains.

Working the sum out in the same manner as before, we get—



A B + C D = 2·20; divided by 2 = 1·10.
A D + B C = 2·80; divided by 2 = 1·40.

1·10 × 1·40 = ·15400 (five figures being cut off).

Thus our land is seen to be less than an acre.

Multiply by 4 for the roods, if any—

·15400 × 4 = ·61600.

The land, therefore, does not contain 1 rood.

Multiply by 40 for the perches—

·61600 × 40 = 24·64000 = 24 perches and a fraction.

Multiply by 30·75 for square yards—

·64000 × 30·75 = 19·68; or 19 square yards.

As square feet may be valuable in a city allotment, we go further and multiply the decimal ·68 by 9—

·68 × 9 = 6·12; or 6 square feet.

Our allotment is thus found to contain—

24 perches 19 square yards 6 square feet.

STANDARD WEIGHTS OF CEREALS.

Maize	56 lb. per bushel.
Wheat	60 „ „ „
Barley	48 „ „ „
Oats	40 „ „ „

R

SUGAR FROM MILK.

SUGAR, as is well known to most people, is not obtained solely from the sugar-cane and beetroot, but from sources which would appear the most unlikely to yield any edible product. Take coal tar, for instance, from which so many beautiful dyes are obtained, and we believe also an exquisite scent. From the foul-smelling tar a very sweet sugar is obtained. In fact, so excessive are the sweetening properties of coal-tar sugar, that a quantity sufficient only to thinly cover a threepenny piece will suffice to sweeten a large cup of tea. Maple sugar is largely produced in North America from the maple-tree. In that country, *Chicago Produce* says that at Marengo, Ill., sugar is made from the whey from the cheese vats. This whey is forced into large boilers, and after boiling for some time it is run into evaporating pans, where the boiling is continued until a thick syrup is left. After standing a certain length of time it is again boiled, when the sugar forms. The sugar is worked over till thoroughly drained, and is then packed in barrels for the refinery. It now resembles the ordinary brown sugar of commerce. The secret of refining is known only to two persons. When the product emerges from the refinery it is snow white. A new factory has just been completed at Marengo. It requires 5,000 lb. of milk to produce one barrel of sugar, which sells at 40 cents (1s. 8d.) per lb. There are thus at least four commercial products resulting from the manipulation of milk—viz., butter, cheese, cream, and sugar, besides which there are waste products which are utilised by farmers in feeding stock.

RAPID REFINING OF RAW SUGARS.

A NEW process of refining raw sugars has been invented by a French engineer, M. Robin Langlois. This gentleman has perfected a process for reducing raw sugars, made from either cane or beet, to solid cubes of white sugar possessing all the characteristics and qualities of the best refined sugar. What constitutes the great value of the invention is, that whereas fifteen or sixteen days are required in our refineries to transform raws to whites, only a few hours are requisite under the new process.

SUGAR AT BUNDABERG.

MESSRS. GIBSON BROS., of Bingera and Watawa plantations, at Bundaberg, have turned out the largest quantity of sugar during the past season of any single mill in the district. The total output was 9,500 tons of 88·0 net titre, which is a record for Bundaberg. The mill ran for three months, and during that period 90,000 tons of cane went through the rollers. Of this quantity, 40,000 tons were purchased and 30,000 were brought in by rail, the balance coming from the plantation.

At the end of January, Knockroe (A. C. Walker) closed down, having made 6,500 tons from 65,000 tons of cane. This plantation is owned by Mr. A. C. Walker, and the mill by Messrs. T. Penny and Co.

Windermere had a long season, extending over thirty weeks, which is the longest run on record. Twenty-four thousand tons of cane passed through the mill. Some fifty or sixty acres had, however, to stand over. Nearly the whole of this plantation is leased on the royalty system, and the leaseholders have been very successful with their crops, which have in the main all been good. The mill is the property of the Windermere Sugar-mill Company, and is located about the centre of the Windermere Plantation, which is owned by Mr. F. L. Nott, who is also manager for the company.

The Isis Scrub correspondent of the *Maryborough Chronicle* says that between 10,000 and 12,000 tons of cane are left to stand over which should have been harvested this season, and that next season's crop promises to be larger than the present one. This would point to the necessity for increased crushing appliances.

BUTTER AT BUNDABERG.

The first shipment of butter from Bundaberg to England by the Bundaberg Dairy Company, which is managed by Mr. D. Gibson, was sent to Sydney last month. The shipment, consisting of 100 boxes, was consigned to Messrs. Shelton and Brown, Brisbane, for transmission. The butter was most carefully prepared under the supervision of the manager, and was made from the very best cream, uniform in quality, and was salted to stand the journey. Another consignment of 100 boxes will be sent in about a week's time.

BELATOURKA WHEAT.

As showing the hardiness of Belatourka wheat during protracted periods of drought, we were shown a sample of the straw and ear grown by Mr. Percival, of Lord John Swamp, near Warwick, which was considerably over 7 feet in height; the crop was a clean upstanding one, free from rust, and ears well formed, grain full, no pinching. Mr. Percival found some difficulty with the reaper and binder, owing to the straw being too long to travel over the carrier of the machine, notwithstanding that the cutting gear was raised to the highest point.

It should be stated that only 2 inches of rain fell from the sowing of the seed until the grain was harvested.

A fine sample of the same wheat was also grown at the Hermitage Experiment Farm, near Warwick. The wheat is equal in height, cleanness from rust, and fullness of ear to that above mentioned.

Given fair seasons, and the Downs will hold their own, and even surpass many of the older wheat-growing countries.

PINEAPPLE FIBRE.

The fibre derived from the pineapple plant has hitherto been generally supposed to be a product of the leaves, as is the case with Sisal hemp and other plants of the aloe tribe, but we now learn from the *Ceylon Tropical Agriculturist* that a trial shipment of pineapple fibre has been received from the Hon. J. Buckingham, C.I.E., of Amguri, Assam, by the Imperial Institute, prepared from the rough outer covering of the fruit. Several tons of the fibre were sent over to England, and the material has been well reported of. It is said to nearly resemble flax and to be suitable for spinning into fine twine, and, if properly softened, for textile purposes. Its value is set down at from £20 to £25 per ton. The process by which the fibre was prepared is not stated.

PRICE OF FERTILISERS.

By an oversight the cost of nitrate of soda, superphosphate and kainit was set down in our February number at "per sack." It should have been "per cwt."

APPOINTMENT OF A COFFEE EXPERT.

The extension of the coffee-growing industry in Queensland, especially in the Northern portion of the colony, having drawn the attention of the Department of Agriculture to the necessity for instructing planters, present and prospective, in the best methods of conducting planting and curing operations, the services of Mr. Howard Newport have been engaged. Mr. Newport is a coffee-planter of eleven years' experience in India, where he successfully managed a plantation at Melrose, Yercand, in the Madras Presidency. He also visited Ceylon, where he applied himself to the study of coffee culture in that island. He is at present visiting all the districts where coffee is being grown, and will advise planters on the best methods to be adopted in all branches of the industry in order to ensure success.

CONVENIENCES FOR HANDLING COWS.

MR. H. C. QUODLING, Manager of the Westbrook Experiment Farm, gives the accompanying sketch of a convenient method of bailing up cows for milking. In numerous places throughout the country, where a living is made by dairy-farming, the absence of a systematic method in working the cows is very noticeable.

Where cows are not housed, but a number are brought in to be milked and fed twice a day, the following method should commend itself :—

The object is to pass all cows as they are milked through the gate at the head of the bail into a receiving-yard, where they can be disposed of as convenient for pasture, thus saving all drafting. Feeding is accomplished through a hinged or sliding-door in front of the cow, the box being protected from outside by boarding in.

Plough-line rope running through a series of pulleys arranged as in attached sketch facilitates the work.

This form of bail has proved itself to be economical and efficient on the class of holding for which it is especially designed.

HOUSEHOLD HINTS.

A CONTRIBUTOR from Mooloolah sends us the two following recipes, which are well worthy of a line :—

OKRA, OR GUMBO (INDIAN BHINDIE).

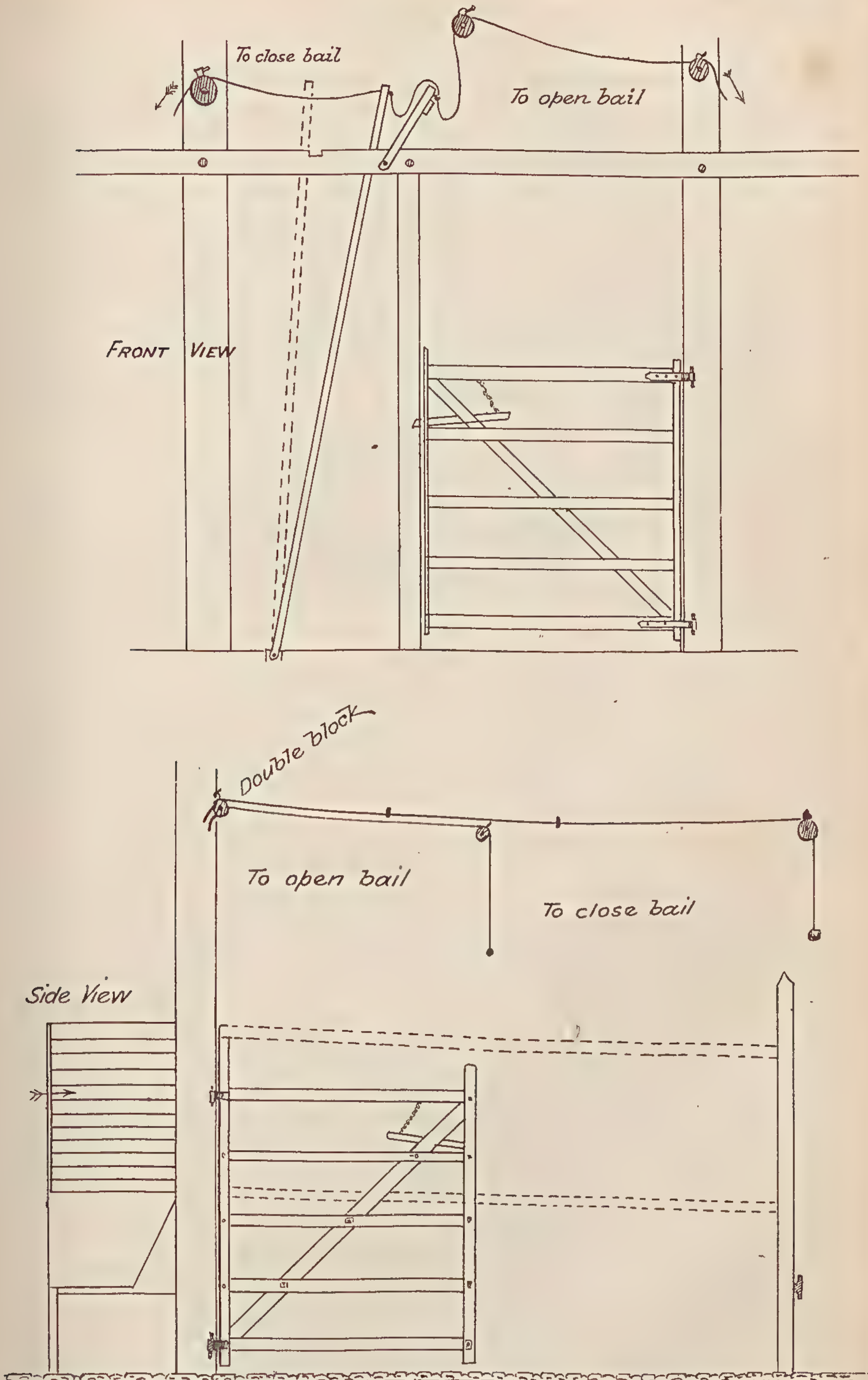
This vegetable, though easily grown in Queensland, seems to be little known or appreciated, yet, to judge by the glutinous substance which comes from it after cooking, it is both wholesome and nutritious.

In India the okra (or "Bhindie," as it is universally called there) is largely used; and though the writer came from there to Queensland nearly two years ago, it is only recently that she has tried it here, and found it very tasty and well adapted for culinary purposes, especially out in the bush where every variety of vegetable is much appreciated. She has prepared it in different ways, all of which have been approved of by those who have eaten it. The simplest method is to boil it as you would potatoes, only that in the okra you never remove the skin, but put the vegetable in whole. Another way is to use the okra in curry; either with meat or just along with potatoes, cabbage, &c., cut up—curry powder, sugar, and vinegar being added. This in India is called "chechkie" (vegetable curry). And thirdly, after browning some thin-sliced onions, the okra may be fried with them; this makes a tasty accompaniment to any meat dish. For curry, the okra should be cut into pieces about $1\frac{1}{2}$ inches long; and for the "fry," even less than $\frac{1}{2}$-inch. They should be plucked when tender. About 15 minutes' boiling suffices. When boiled, care should be taken that they do not break, or else the glutinous substance will ooze out. Okra is also a nice addition to soup, for which it should be cut in very thin slices, and added about 15 minutes before serving. In every case the okra should be cut through or across, not lengthwise.

BANANA JELLY.

The same correspondent has been rather surprised that nobody to whom she has spoken has ever heard of or tried to make banana jelly. She attempted it, and, after two failures, managed on her third trial to get a very nice jelly, which should prove a boon to those living in the bush, where bananas are, as a rule, plentiful. The following was the method she adopted: Peel the fruit, cut into pieces, add three cups of water to each lb. of bananas, and boil 1 hour or till quite soft enough to admit of being strained through a net. After straining, add the sugar (which should be the same weight as the fruit when peeled and cut up) and some citric or tartaric acid to taste (dissolved in a little water before adding). Boil all for at least 1 hour, when the jelly will assume a nice colour and consistency. Such has been the experience of the writer, who hopes others will also find it a success.

Plate XCIII.



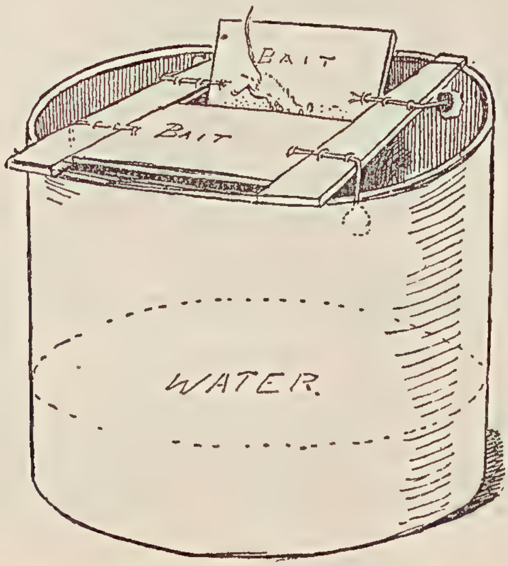
Scale 2 feet to an inch

A CONVENIENT COW-BAIL.

INGENIOUS RAT TRAPS.

ALL housewives, especially those dwelling in cities and suburbs, know to their cost what nuisances rats are in houses and barns, and devices innumerable have been imagined for entrapping this most wary of all rodents But it is as difficult to entice an old rat into the usual style of trap as induce a young bush colt to approach a steamroller. In view of the many in all parts of the colony who are troubled with rats, we offer no apology for inserting in an *Agricultural Journal* the following hints by "Country Chemist," which lately appeared in the *Farmer and Stockbreeder* (London) :—

Take a common earthenware pot with, say, 4 inches of water at the bottom. Fix two boards across it as shown in the figure, and connect these by a transverse board divided in the middle, fixing each half by wire hinges at the cross, and weighting it at each end with lead. The whole surface is now level, and the board is spread with bait. Now the rat steps forward, pop goes the trap door, down goes ratty, and the door adjusts itself to receive more, like a collecting box.



The uneducated rat of early summer is easily enough caught in any sort of trap, but as time goes on the young rats have learned the smell of the human animal, and detect it on the well-baited trap which has been too much handled in getting that fine adjustment, which is essential to springing it easily.

SCENT TO USE.

This being so, it is desirable to employ some strong scent that will both mask the human odour and prove attractive to rats. At the head of these stands oil of rhodium, but it has the objection of being too expensive for any but the professional rat-catcher. Next in point of attractiveness is oil of aniseed. Bruised valerian root is liked by most rodents, but it has the great objection of mustering all the cats in the district, and even if you do not mind their late concerts, you do not want them to be caught in clams, or spring your trap to no purpose. Oil of aniseed is not too expensive if used with reasonable care, and seldom fails to draw. As proof of the scent of rats I have quite recently handled a linseed cake on three sides, and not on the fourth, and then placed it where rats come nightly, and they have refused to touch the handled sides while eating the other. Wire traps and gins or clams being purchased traps, I will pass on after remarking that they should be set *in the ground* and *not on it*, and that the earth should be scraped away with a mane comb, whose teeth have been anointed with aniseed oil.

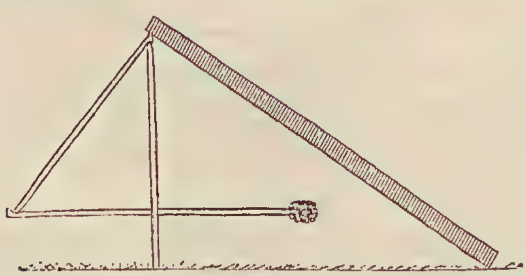
Whatever sort of bait is chosen, the trapper should be content to give away a little and wait. Now just the opposite is the rule of conduct with the novice in vermin-killing. He gets a trap and the most attractive bait he can think of, and then shoves it right up against a hole, as if he were trying to block the gangway. Now what rat with any experience would walk into it? No, that is how *not* to do it. A very nice supper but not enough to give a surfeit should be provided, outside the trap (of whatever sort). The unaccustomed object should be left innocently by and set open in a manner that it cannot be sprung. Let your intended victim associate it in his mind with a pleasant evening, and he will come again with suspicion disarmed. One of the most successful traps in my experience is the bucket trick. As there may be readers who do not know it, let me briefly describe the manner of procedure.

DECEIVING THE RAT.

You begin by littering corn or other food on the floor, and let this lead up to a bucket, against the side of which a piece of wood has been carelessly left. The rat climbing to the top, should find it conveniently full of corn or other attractive food, with chaff to give it bulk. Let him have his fill that night, or, better, still for several nights; then when you are ready to compass his destruction, fill the bucket rather more than half full of water, and lightly throw some chaff on top, A good inch of it will keep dry a long time, and your bait, of course, on top. With a misplaced confidence the rat walks up the stick, jumps down on his supper only to find himself in deep water, and so impeded with the chaff that he is sooner drowned. This old trick was discovered by accident, and often several rats have been found in the bucket at one time. This latter fact would point to the importance of luring the enemy to destruction by false confidence, or how else could several fall victims at once? Surely they must have run a race for precedence, and so stumbled in one over another.

ANOTHER EFFECTIVE TRAP.

The "dead fall" is another homely trap which costs nothing, and often does more execution than expensive engines purchased of the ironmonger. The lid of a box or a stout piece of planking, 15 to 20 inches long, and about the same width, should be set up for a night or two, supported at one end by a stick and a brick or two, to ensure its not falling while the rats make their



supper under and around the innocent-looking object. Meantime, three slips of wood, no stouter than will just support the board with a heavy stone on top, should be prepared. The cut above will show how a figure of 4 is made to act as a support until the movement of the bait acts as a lever, and down comes the weighted board on the animal beneath.

JOHNSON GRASS AGAIN.

REFERRING to our notices of the merits and demerits of Johnson grass, Mr. A. Scott writes from Taroom:—I have had considerable experience in growing Johnson grass, and I have found it both good and bad, according to the district and soil in which it has been tried. If you have good soil and a fairly

distributed rainfall, then I should certainly not recommend anyone to sow this grass, as you can get many better grasses for stock feeding. But in poor coast country, or on the Dawson, where the soil is good, but the rainfall uncertain, making the country subject to droughts, I would strongly recommend it, as it stands drought well, and every little passing shower causes it to spring from 1 foot to 18 inches in a very short time. All the stock here are very fond of it.

JADOO FIBRE.

Our correspondent also makes inquiries concerning the quantities of the various fertilisers used in preparing the peat for use as Jadoo. We cannot yet supply the proportions of the various ingredients, but, as the proprietor of the patent has promised to give the quantities if asked for them, we will try and give the information in our next number. The Peat-moss used is the fibrous soil of certain swamps, but all peats are not suitable. As a large quantity of the material is now used in Australasia, it has, we learn, become desirable, in order to reduce the cost, to try and find a suitable vehicle for the fertilisers in an indigenous peat, but no suitable substance has yet been found.

Mr. Scott has tried swamp soil with much success by preparing it as follows:—First put down a layer of the swamp peat; cover this with a layer of lime, another of rotten kauri pine; over this fill in stockyard manure; make some six layers in all, and allow them to thoroughly rot. Fruit trees mulched with this mixture show very good results.

AGRICULTURAL AND HORTICULTURAL SHOWS.

The Editor will be glad if the secretaries of Agricultural and other Societies will, as early as possible after the fixture of their respective shows, notify him of the date, and also of any change in date which may have been decided on.

The Markets.

AVERAGE PRICES FOR JANUARY.

Article.		JANUARY. Top Prices.
		£ s. d.
Bacon	lb.	0 0 7
Bran	ton	5 6 9
Butter, First	lb.	0 0 10⅝
Butter, Second	,,	0 0 6
Chaff, Mixed	ton	3 14 9
Chaff, Oaten	,,	4 5 3
Chaff, Lucerne	,,	3 14 9
Chaff, Wheaten	,,	3 0 0
Cheese	lb.	0 0 8½
Flour	ton	9 6 8
Hay, Oaten	,,	3 12 6
Hay, Lucerne	,,	2 14 9
Honey	lb.	0 0 2
Japan Rice, Bond	ton	15 5 9
Maize	bush.	0 4 10
Oats	,,	0 3 6
Pollard	ton	6 8 1½
Potatoes	,,	10 13 3
Potatoes, Sweet	,,	4 3 4
Pumpkins	,,	3 11 8
Sugar, White	,,	15 10 0
Sugar, Yellow	,,	11 10 0
Sugar, Ration	,,	10 0 0
Wheat	bush.	0 3 3¾
Onions	cwt.	0 6 6¾
Hams	lb.	0 0 9
Eggs	doz.	0 1 0$\frac{15}{16}$
Fowls	pair	0 3 7½
Geese	,,	0 4 8¾
Ducks, English	,,	0 3 0
Ducks, Muscovy	,,	0 4 6
Turkeys, Hens	,,	0 6 4½
Turkeys, Gobblers	,,	0 15 0

Orchard Notes for March.

By ALBERT H. BENSON.

The citrus season is now commencing. Early oranges will be ready to ship from the Maryborough and Northern districts during the month, for, though they will not have developed their full flavour, the Southern markets are bare of any main crop citrus fruits, and our oranges, in consequence, meet with a ready sale. Citrus fruits should always be cut, not pulled from the tree, and should be handled as gently as possible. They should be carefully graded for colour, size, and quality before packing, and should be firmly packed so that there is no danger of bruising during transit, as slackly packed fruit always bruises more or less badly. Early fruit usually carries well, as the skins are fine and tough, and not nearly as soft and brittle as they become when the fruit is fully ripe, so that with ordinary care they should reach the Southern markets without loss and in first-class condition. Main crop lemons should be getting ready to cut, as, if allowed to remain on the trees too long, they only become coarse and worthless for storing or shipping—in fact, only of value for preserving. Main crop lemons cure and keep well, the only secret in the curing being to cut the fruit at the right stage, which is usually just as it begins to get the first tinge of yellow, to handle it carefully so as to prevent bruising, and then to store in a darkened place having an even cool temperature and only moderate ventilation, but the store must not be too damp. Lemons gathered at the right time, carefully handled, and properly cured will keep for months, and will always bring more money than if they are allowed to remain on the trees till they become coarse and over-ripe. Strawberry planting can be continued during the month, advantage being taken of any dull showery days for setting out the plants. Where new orchards are to be planted the ground should now be under preparation, as if new land is to be planted it is advisable to allow it to become well exposed to the air, so as to sweeten it and render it friable for some time before the trees are planted.

Dead or superfluous trees can be removed during the month; and when replanting on the same spot is desirable, then the hole from which the dead tree has been taken should be left open, and the soil left exposed to the action of the air, so as to sweeten it before a fresh tree is planted in the same spot.

Keep the orchards well cultivated, and fight insect and fungus pests whenever and wherever found. Look out for the fruit fly, especially in guavas, as if the infected fruits are carefully gathered and destroyed it will prevent a large number of flies from hatching out and destroying mandarins, cumquats, and oranges. In the earlier part of last citrus season a large number of oranges were destroyed by the larvæ of the peach moth, the first sign that the fruit was attacked being a premature ripening, and if the fruit was carefully examined a very small hole, usually at the stem or where two fruits touched, was found; and when the fruit was dissected a small caterpillar, similar to that met with in maize and peaches, was found. The fruit when attacked fell off, and considerable loss was occasioned in several districts. The best remedy will probably be to spray the fruit, before it begins to colour, with Paris green, 1 oz. to 10 gallons of water, adding a little lime to the water to make the poison adhere better. This moth is becoming very common, and is doing a large amount of damage to all kinds of fruit, and, like the fruit fly, it would be kept considerably in check were the destruction of fallen infected fruit properly carried out, as a large proportion of the larvæ would be destroyed with the fruit.

Farm Notes for March.

The fine rains of last month have left the land in excellent condition for ploughing. Take every opportunity of turning up the ground in readiness for sowing and planting. During this month get in the main crop of potatoes. The weather being suitable it is a good rule to get the bulk of the potatoes planted by the middle of the month. The growth of weeds will now be slackening off, so that lucerne may be sown on deeply cultivated soil. The latter should be rich and friable, with a porous subsoil, and should be thoroughly pulverised. The land should have been prepared during the two previous months, care being taken to cross-plough and harrow before the weeds have gone to seed. This insures a clean field. Sow either broadcast or in drills. Should weeds make their appearance before the plants have sent down their tap roots, mow the field. Before the weeds can come up again to do damage, the lucerne will be strong enough to make head against them. After this has happened, the field should be harrowed and rolled. In late districts maize may still be sown for a late crop, but where frosts come early it is not advisable to sow maize during this month. Rye-grass, prairie-grass, oats, barley, wheat, sorghum, vetches, carrots, mangolds, and Swede turnips may be sown. Gather all ripened maize and cut tobacco, leaving the leaves to wilt on the ground.

In Northern Queensland sow tobacco seed, cow pea, Carob beans, sweet potatoes. The first trashing of sugar-cane should take place. Kola-nut cuttings can be planted out, and Jack-fruit seeds and anatto sown. Coffee-planting may be proceeded with.

Garden Notes for March.

By H. W. GORRIE,
Horticulturist, Queensland Agricultural College.

Kitchen Garden.—This is a busy month in the vegetable garden, as now is the time for sowing most of the winter crops. Whenever the soil is in good condition for sowing—that is, when it is moist and mellow from previous rain—sowings should be made of the following vegetables:—Broad beans, peas, turnips (Swede and white stone), carrots, parsnips, onions, beet, spinach, and radish. These may all be sown in drills from 2 to 3 feet apart. Sow in seed beds celery, lettuce, parsley, and herbs of sorts; also make fresh sowings of cabbage, Brussels sprouts, cauliflower, and kohl-rabi. In showery weather plant out cabbage, cauliflower, &c., of which there should now be an abundant supply in the beds. If the young plants are attacked by grubs, spray with Paris green. Eschallots and leeks may now be planted out; in fact, nearly all European vegetables can be safely planted in March. This is about the best time to plant strawberries. Select strong healthy runners, and water if ecessary until they become established.

Flower Garden.—Now is a good time to plant out bulbs of freesias, ranunculus, anemones, &c. Dianthus, phlox, sunflowers, and various annuals may be planted out in favourable weather. Sowings should be made to as large an extent as may be required of anterrhinums, asters, cornflowers, dianthus, larkspurs, daisies, cosmia, candytuft, lupins, gaillardias, godetia, mignonette, poppies, pansies, phlox, sweet peas, &c., &c. Keep the borders and flower beds well stirred with the hoe to prevent the soil baking on the surface after rain. Look over roses which have been budded, and loosen the ties if necessary. Unless this is attended to, the strings will cut into the stems as the latter increase in size. Give chrysanthemums plenty of liquid manure, and especially attend to such as are likely to come into flower soon. Many of the semi-tropical shrubs may be safely planted out in favourable weather during the month. If planted now, they obtain a good hold of the ground, and become well established and hardy before the cold weather sets in.

Public Announcements.

The Editor will be glad to receive any papers of special merit which may be read at meetings of Agricultural and Pastoral Associations in Queensland, reserving, however, the right to decide whether their value and importance will justify their publication.

We shall be pleased to receive reports of the progress of Butter and Cheese Factories and Creameries for publication.

The *Queensland Agricultural Journal* will be supplied to all members of Agricultural and Horticultural Societies who do not derive their livelihood solely from the land, on payment, in advance, of an annual subscription of 5s.

GOVERNMENT AGRICULTURAL LABORATORY.

INSTRUCTION FOR THE COLLECTION OF SAMPLES, AND SCALE OF FEES.

GENERAL INSTRUCTIONS.

1. All analyses are carried out in their turn as they arrive at the Laboratory.

2. Should a customer wish for an immediate analysis, the fee, as provided by scale of fees below, will be increased by 50 per cent.

3. The samples may be forwarded by parcel post or by rail, either to the Under Secretary for Agriculture, Brisbane, or direct to the Chemist, Agricultural Laboratory, at the Agricultural College, Gatton; but in any case the required fee must be transmitted at the same time.

4. Analyses will be only carried out, if samples are taken strictly in accordance with the instructions issued below.

SCALE OF FEES.

	Farmers, Selectors, Gardeners. £	s.	d.
Soil—Short analysis (estimation of lime, alkalies, nitrogen, and phosphoric acid)	2	2	0
Soil and Subsoil—Short analysis	3	3	0
Soil—Complete analysis	4	4	0
Water—Analysis	3	3	0
Manures—			
Complete analysis	2	2	0
Nitrogen only	0	7	6
Potash only	0	7	6
Phosphoric acid sol.	0	15	0
Phosphoric acid insol.	0	15	0
Food Stuffs—			
Complete analysis	2	2	0
Water only	0	5	0
Albuminoids	0	10	0
Oil or fat	0	7	6
Ash	0	5	0
Fibre	0	7	6
Sugar-cane, sugar-beet, megass—Analysis of	1	1	0
Sugar, massecuite, jelly, molasses	1	1	0
Milk, butter, cheese—Complete analysis	1	0	0
Tanning materials (tannin estim.)	1	0	0
Soaps	1	10	0
Limestone, cement, clay, &c....	3	0	0

INSTRUCTIONS FOR TAKING AND COLLECTING OF SAMPLES.

SOILS AND SUBSOILS.

To obtain a fair average sample of the soil of a block of land, as near as possible, equal quantities of soil are taken from various parts of the fields.

A sketch plan of the field, paddock, or block of land on which the samples were taken should accompany the samples, and the spots where samples are taken are marked on this plan and numbered. This sketch plan should also indicate position of roads, creeks, gullies, ridges, general fall of the land, &c.

Should the soil in various parts of the block show a very marked difference, it will be necessary to divide the block into two, rarely in more, parts. Should the different soil occur only in a small patch, this sample may be left out.

Not less than three samples should be taken in each section. A greater number is to be preferred, as a better average will be obtained.

At the places chosen for the taking of the samples the surface is slightly scraped with a sharp tool, to remove any surface vegetation which has not as yet become part of the soil.

Vertical holes from 10 to 18 inches square are dug in the ground to a depth of 2 feet 6 inches to 3 feet.

The holes are dug out like post-holes; an earth-auger facilitates the operation considerably, and the holes may be trimmed with the spade afterwards.

Careful note of the appearance of the freshly cut soil and subsoil should be taken. The depth of the real soil, which in most cases is easily distinguished, is also measured and noted for each hole. Note how deep the roots of the surface vegetation reach into the soil. If the soil changes gradually into the subsoil, as is the case in some places where the soil is of very great depth, this line of division is guessed approximately, or it is best to take the soil uniformly to a depth of 12 inches.

With a spade a slice of soil is now cut off and put on to a clean bag. The same is done with the subsoil, and the slice is taken from where the soil ends (or 12 inches) to the bottom of the hole, and this subsoil placed on another bag. Stones over the size of a pea may be picked out, the rough quantity of such stones estimated, and a few enclosed with the samples. Fine roots must not be taken out from the soil samples. The same operation is repeated at the other places chosen. Careful note and description in each hole, as numbered and marked on plan given, and the samples of soil collected on the one bag thoroughly mixed by breaking up any large clods, and about 10 lb. of the mixture put into a clean canvas bag, which is securely tied up and labelled. The same is done with the samples of subsoil collected on the other bag.

All the samples collected are afterwards placed into a wooden box.

It is important to use clean bags and clean boxes, and also that the samples should not be left in the neighbourhood of stables or manure heaps. A short description of the land must accompany the samples and the sketch plan.

In the case of cultivated land, state how long the land was under cultivation, what crops were chiefly grown, result of such crops, was any manure applied, when, and what sort, and in what quantities per acre. In the case of virgin soil, state if the land was heavily timbered or not, ringbarked, if scrub or forest land, what sort of timber was chiefly growing on the land. In all cases a description of the neighbouring land, outcropping rocks, &c., are of great value. Also state if the land is naturally or artificially drained or not; describe the land as regards its position to hills, roads, creeks, ridges, &c. Only by adhering strictly to these instructions, and by giving minute details, benefit can be derived from the soil analyses.

WATER.

It is best to collect and forward samples of water for analysis in stoppered glass bottles, generally known as Winchester quarts.

The bottles have to be perfectly clean, and stoppers must fit well. Corks should be avoided, but if used must be new and well washed with the water before being used for closing the bottle.

When taking waters from taps, pumps, bores, the water has to be allowed to run for a while before taking the sample. When taking the water out of a well, pond, or river, the bottle is completely immersed, but care has to be taken not to disturb the mud or sediment at the bottom of the water. Before the sample is actually collected, the bottle is rinsed three times with the water, filling each time about one-third full. The bottle is then filled within about 1 inch from the top; the stopper is inserted and securely tied down with a clean piece of linen or calico.

The stopper must not be fastened or luted with sealing-wax, paste, plaster of paris, &c.

MANURES.

When taking samples of artificial manures out of bags, the sample must be taken from different bags and at different places of the bag and not only from the top, or the bags before being used are emptied on a heap and mixed up well and the sample then taken. About 1 to 2 lb. put into a clean bag should be forwarded for analysis.

FOOD STUFFS.

It is always important to obtain good average samples, and this can only be done by great care in taking the samples from different places, mixing well, and taking a small part of the mixture. This method would apply to any dry food-stuff—as grains of any kind, peas, beans, chaff, pollard, meal, &c. For the analysis of green foods—as green hay, sorghum, silage—it is best to make a mixture of the sample by passing it through a chaffcutter, and by taking an accurately weighed quantity—say 1 lb. This quantity may then be dried in the sun, taking care that nothing is lost, and when dry put in a bag and forwarded for analysis. The green samples may also be forwarded without drying in fruit-preserving jars.

To collect information about value of *green manures*, it is best to plot out exactly one square yard in the field covered with the plant, not picking out a position where the growth is very heavy or poor, but about a fair average. Four pegs are driven into the ground at the four corners, and string stretched between them; with a sharp spade all the plants are cut along the strings, so as to get really the growth of one square yard. The plants are all collected and accurately weighed, passed through a chaffcutter, and the sample for analysis taken as above described. In many cases the roots may be also pulled out, weighed separately, and a sample forwarded.

The samples have to be accompanied by a description of the crop—when planted, how old when cut, if the land was manured or not, weight of crop per acre or per square yard, and weight of the sample forwarded when in its green state. In the case of green manures it is generally best to take the samples at the same time when ploughed under, just after flowering.

"THE DISEASES IN PLANTS ACT OF 1896."

Department of Agriculture,
Brisbane, 19th January, 1899.

HIS Excellency the Governor, with the advice of the Executive Council, and in pursuance of the provisions of "*The Diseases in Plants Act of* 1896," has been pleased to make the following further Regulations.

J. V. CHATAWAY.

THE FUMIGATION OF FRUIT FOR EXPORT.

1. Any one who wishes to erect a chamber or building for the fumigating of fruit is requested to give notice to the Under Secretary for Agriculture, who will take steps to see that the chamber or building is properly constructed.

2. When it is required to fumigate fruit for export, twenty-four hours' notice must be given to the said Under Secretary or such other officer as may be duly authorised to accept such notice.

3. The operation of fumigating must be conducted under the control of an officer authorised by the Minister for Agriculture.

4. The fumigating chamber may be made of any convenient size or material, the essential point being that it shall be capable of being closed absolutely airtight, and provided with a flue-pipe in the roof which can be opened or closed to allow of the escape of the gas after fumigation. The flue must be provided with a box or chamber to contain caustic soda or potash to destroy the gas.

The fumigating chamber must be provided with a shutter or sliding panel in the lower portion of the door or wall.

Door, flue, and shutter must all be made to close absolutely airtight.

DIRECTIONS FOR FUMIGATING WITH HYDROCYANIC ACID GAS.

Proportions of Ingredients.—For every 150 cubic feet of room take 1 ounce of cyanide of potassium, 5 fluid ounces sulphuric acid, 10 fluid ounces water.

Having placed the fruit to be fumigated in the chamber, see that the flue and the shutter in the door or lower part of all are properly closed.

The acid is then to be diluted in the following manner:—The whole of the water is placed in a shallow china or glazed earthenware vessel, such as an ordinary wash-hand basin. (Metal vessels are inadvisable unless they are leaden ones.) The sulphuric acid is next poured on to the water in a thin stream, stirring the while with a stick. Do not mix by adding the water to the acid.

The basin containing the acid thus diluted (which should be allowed to cool) is now placed in the fumigating chamber, and the cyanide of potassium is emptied into it.

The gas is given off with great violence, and the door should be immediately closed.

The whole is now to be left to itself for one hour. At the end of this time the shutters in the flue and in the door are opened, and the draught produced drives the gas out of the chamber. At the end of half an hour the door is thrown open, and if the draught has been effective there should be hardly any trace of hydrocyanic gas recognisable. The chamber may be left in this condition for another ten minutes or a quarter of an hour. The fruit is now to be moved and allowed to remain in a well ventilated place, preferably out of doors, for another half an hour. Samples of fruit will be examined from time to time by the entomologist.

Caution.—As hydrocyanic acid gas is most deadly in its effects on animal life, the greatest care must be taken in its use.

Department of Agriculture,
Brisbane, , 18 .

This is to certify that has treated cases of citrus fruit with hydrocyanic acid gas for one hour, under my supervision. These cases have been branded "Crown" over "Passed."

Shipping marks:
Per S.S.:
Consigned to:

Department of Agriculture,
Brisbane, 26th January, 1899.

THE following Proclamation by His Excellency the Governor of New South Wales is published for general information.

J. V. CHATAWAY.

NEW SOUTH WALES, to wit.
(L.S.)
HAMPDEN,
Governor.

PROCLAMATION.

By His Excellency The Right Honourable HENRY ROBERT, VISCOUNT HAMPDEN, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

WHEREAS the Governor is empowered by Section 9 of the "Vegetation Diseases Act, 1897," from time to time, by Proclamation in the *Gazette*, to declare any fungus or vegetable parasite whatever to be a fungus within the meaning of the said Act: Now, therefore, I, HENRY ROBERT, VISCOUNT HAMPDEN, the Governor aforesaid, with the advice of the Executive Council, do, by this my Proclamation, declare Black Spot (*Fusicladium*) to be a fungus within the meaning of the said Act.

Given under my Hand and Seal, at Government House, Sydney, this twenty-second day of December, in the year of our Lord one thousand eight hundred and ninety-eight, and in the sixty-second year of Her Majesty's reign.

By His Excellency's Command,

JOSEPH COOK.

GOD SAVE THE QUEEN!

LIST OF AGRICULTURAL, HORTICULTURAL, AND PASTORAL SOCIETIES AND ASSOCIATIONS IN QUEENSLAND.

Postal Address.	Name of Society.	Name of Secretary.	Date of Show.
Allora ...	Central Downs Agricultural and Horticultural Association	J. H. Buxton... ...	1 Feb. 1899
Beaudesert ...	Logan and Albert Pastoral and Agricultural Society	M. Hinchcliffe ...	6 May
Beenleigh ...	Agricultural and Pastoral Society of Southern Queensland	Wilson Holliday ...	30 Sept.
Birthamba ...	South Kolan Agricultural and General Progress Association	G. W. Nixon ...	
Blackall ...	Barcoo Pastoral Society	F. Clewett	
Boonah ...	Fassifern and Dugandan Agricultural and Pastoral Association	J. A. McBean ...	28 April
Booyal Scrub	Booyal Progress Association	H. Masson	
Bowen ...	Pastoral, Agricultural, and Mining Society ...	J. E. Smith	8 June
Bowen ...	Preston Farmers' Association	R. A. Foulger ...	
Bowen ...	Proserpine Farmers' and Settlers' Association	G. W. Pott	
Brisbane ...	Horticultural Society of Queensland	G. K. Seabrook ...	21 and 22 April and 10 Oct.
Brisbane ...	Moreton Agricultural, Horticultural, and Industrial Association	J. Duffield	
Brisbane ...	Queensland Acclimatisation Society	E. Grimley	
Brisbane ..	Queensland Fruit and Economic Plant Growers' Association	G. K. Seabrook ...	
Brisbane ...	National Agricultural and Industrial Association of Queensland	H. C. Wood	10, 11, and 12 Aug.
Brisbane ...	Queensland Stockbreeders' and Graziers' Association	F. A. Blackman ..	
Brisbane ...	United Pastoralists' Association	Fredk. Ranson ..	
Bundaberg ...	Bundaberg Agricultural and Pastoral Society	A. McIntosh... ..	12, 13, and 14 Oct.
Bundaberg ...	Bundaberg Horticultural and Industrial Society	H. E. Ashley... ...	
Bundaberg ...	Woongarra Canegrowers' and Farmers' Association	H. Cattermull ...	
Burpengary...	Burpengary Farmers' Association	C. H. Ham	
Caboolture ...	Caboolture Farmers' Association	G. Mallet	
Cairns ..	Barron Valley Farmers' and Progress Association	W. F. Logan... ...	
Cairns ...	Cairns Agricultural, Pastoral, and Mining Association	A. J. Draper	28 and 29 Sept.
Cairns ...	Hambledon Planters' Association	E. Whitehouse ...	
Charleville ..	Central Warrego Pastoral and Agricultural Association	A. J. Carter	25 and 26 May
Charters Towers	Towers Pastoral, Agricultural, and Mining Association	W. Tilley	
Childers ...	Isis Agricultural Association	H. Epps	
Childers ...	Childers Progress Branch, Isis Agricultural Association	N. Rosenlund ...	
Childers ...	Doolbi Mill Branch, Isis Agricultural Association	W. T. H. Job ...	
Childers ...	Childers Mill Branch, Isis Agricultural Association	H. Epps	
Clermont ...	Peak Downs Pastoral, Horticultural, and Agricultural Society	F. Leysley	
Clermont ...	Peak Downs Dairymen and Settlers' Association	A. G. Pursell ...	
Cooktown ...	Cook District Pastoral and Agricultural Society	W. R. Humphreys ...	
Cordalba ...	Cordalba Farmers' Association	B. Goodliffe	
Currajong ...	Currajong Farmers' Progress Association ...	Wm. Howard ...	
Cunnamulla	South Warrego Pastoral Association	J. Winward	
Degilbo ...	Degilbo Farmers' Progress Association ...	F. A. Griffiths ...	
Gayndah ...	Gayndah Agricultural and Horticultural Association	J. C. Kerr	

AGRICULTURAL AND HORTICULTURAL SOCIETIES—*continued.*

Postal Address.	Name of Society.	Name of Secretary.	Date of Show.
Gin Gin ...	Pastoral and Agricultural Society of Gin Gin	E. K. Wollen ...	
Gladstone ...	Gladstone Pastoral and Agricultural Association	W. J. Manning ...	
Gooburrum, Bundaberg	Gooburrum Farmers' and Canegrowers' Association	W. J. Tutin	
Goondiwindi	MacIntyre River Pastoral and Agricultural Society	A. Gough	
Gympie ...	Agricultural, Mining, and Pastoral Society	F. Vaughan	14 and 15 Sept.
Gympie ..	Gympie Horticultural Society	W. G. Ambrose ...	
Halifax ...	Herbert River Farmers' League	J. Lely	
Helidon ...	Helidon Scrub Farmers' Progress Association	M. Morgan	
Herbert River	Halifax Planters' Club	H. G. Faithful ...	
Herbert River	Macnade Farmers' Association...	E. C. Biggs	
Herbert River	Ripple Creek Farmers' Association	J. W. Grimes ...	
Herberton ...	Mining, Pastoral, and Agricultural Association	John M. Hollway ...	3 and 4 April
Hughenden ..	Hughenden Pastoral and Agricultural Association	W. H. Mulligan ...	10 and 11 May
Ingham	Herbert River Farmers' Association	...	
Ingham ...	Herbert River Pastoral and Agricultural Association	P. S. Cochrane ...	3 Sept.
Ipswich ..	Ipswich and West Moreton Agricultural and Horticultural Society	P. W. Cameron ...	6 Oct.
Ipswich ..	Queensland Pastoral and Agricultural Society	Elias Harding ...	1 and 2 June
Kandanga (near Gympie)	Kandanga Farmers' Association	N. Rasmussen ...	
Kolan ...	Kolan Canegrowers' and Farmers' Association	C. Marks	
Laidley ..	Lockyer Agricultural and Industrial Society	John Fielding ...	26 and 27 July
Loganholme...	Logan Farming and Industrial Association ...	F. W. Peek	
Longreach ...	Longreach Pastoral and Agricultural Society	J. P. Peterson ...	12 April
Lucinda Point	Victoria Farmers' Association	W. S. C. Warren ...	
Mackay	Agricultural, Pastoral, and Mining Association	F. Black	
Mackay ...	Pioneer River Farmers' Association	E. Swayne	
Maryborough	Maryborough Horticultural Society	H. A. Jones	
Maryborough	Wide Bay and Burnett Pastoral and Agricultural Society	G. Willey	5, 6, and 7 July
Miallo ...	Miallo Progress Association	E. F. Welchman ...	
Milbong ...	Milbong Farmers' Association	T. R. Garrick ...	
Mitchell ...	Mitchell and Maranoa Pastoral, Agricultural, and Vinegrowers' Association	H. J. Corbett ...	
Mosman River	Mosman River Farmers' Association	..	
Mount Mee...	Mount Mee Farmers' Association	R. Thomas	
Mount Morgan	Mount Morgan Mining, Agricultural, Poultry, Pastoral, and Horticultural Society	G. Orford	
Mulgrave ...	Mulgrave River Farmers' Association ...	Thos. Swan	
Nerang ...	South Queensland and Border Pastoral and Agricultural Society	W. J. Browne ...	
North Isis ...	North Isis Canegrowers' Association	W. J. Young ...	
Pialba ...	Pialba Farmers' Association	J. B. Stephens ...	
Pinbarren ...	Pinbarren Agricultural and Progress Association	H. Armitage, senr. ...	
Rockhampton	Central Queensland Farmers' and Selectors' Association	T. Whitely, Coowonga	
Rockhampton	Central Queensland Pastoral Employers' Association	G. Mackay	

AGRICULTURAL AND HORTICULTURAL SOCIETIES—*continued.*

Postal Address.	Name of Society.	Name of Secretary.	Date of Show.
Rockhampton	Central Queensland Stockowners' Association	R. R. Dawbarn ...	
Rockhampton	Rockhampton Agricultural Society	R. R. Dawbarn ...	10 and 11 May
Roma ...	Western Queensland Pastoral and Agricultural Association	H. K. Alford ...	10 and 11 May
Roma ...	Yingerbay Farmers' Association	F. E. Glazier... ...	
Rosewood ..	Farmers' Club	P. H. Adams... ...	25 Aug.
Springsure ...	Queensland Pastoral Society	G. R. Milliken ...	
Stanthorpe ...	Border Agricultural, Pastoral, and Mining Society	Geo. Simcocks ...	
Stanthorpe ...	Stanthorpe Horticultural and Viticultural Society	R. Hoggan	
St. George ...	Balonne Pastoral and Agricultural Association	T. M. Cummings ...	
Toowoomba	Darling Downs Horticultural Association ...	H. Hopkins	
Toowoomba	Drayton and Toowoomba Agricultural and Horticultural Society	H. Symes	
Toowoomba	Royal Agricultural Society of Queensland ...	F. Burtt	2, 3, and 4 Aug.
Townsville ...	Townsville Pastoral, Agricultural, and Industrial Association (formerly North Queensland Pastoral and Agricultural Association)	J. N. Parkes	
Wallumbilla	Wallumbilla Farmers' Association	P. W. Howse ...	
Warwick ...	Eastern Downs Horticultural and Agricultural Association	J. Selke	25 and 26 Jan., 1899
Wellington Point	Wellington Point Agricultural, Horticultural, and Industrial Association	J. B. Blaine	6 Aug.
Woombye ...	Woombye Fruitgrowers' Association	P. S. Hungerford ...	
Woowoonga	Woowoonga Scrub Farmers' Association ...	H. B. Griffiths ...	

By Authority: Edmund Gregory, Government Printer, William street, Brisbane.

Plate XCIV.

VIEW IN THE BRISBANE BOTANIC GARDEN.

Agriculture.

MARKET GARDENING.

THE VEGETABLE GARDEN.

Garden vegetables do not exhaust the soils on which they are grown to any extent as compared with the exhaustion produced by many field crops. Peas and beans are the most exhausting crops.

Mr. G. McCarthy, of the N.C. Experiment Station, says that the chief ingredient in a good fertiliser for vegetables of which the leaves or stems are the edible portion is nitrogen. For root vegetables phosphoric acid and potash are about as important as nitrogen. For vegetables of which the seed is the edible portion, especially such as are planted early, like the garden pea, phosphoric acid is the leading element. For vegetables like the tomato, egg-plant, celery, melon, &c., potash is the most important. The following table shows the amount of the different elements of plant food in 1,000 lb. of the edible portion of the vegetables named:—

Vegetables.	Nitrogen.	Potash.	Phosphoric Acid.
	lb.	lb.	lb.
Beans	32·9	15·5	9·5
Beets	3·4	4·4	0·9
Cabbage	3·8	4·3	1·1
Cucumber	1·6	2·4	1·2
Pea	35·8	10·1	8·4
Rhubarb	1·3	3·6	0·2
Spinach	2·9	2·7	1·6
Squash	1·1	8·9	1·6
Sweet Corn	4·6	2·2	0·7
Tomato	1·6	0·5	2·2
Turnips	1·8	3·9	1·0

Except only as to peas and beans, it will be seen that vegetables are not very exhausting to the soil. Peas and beans are able to take most of their nitrogen from the atmosphere. The table shows that potash is the element mostly drawn from the soil, next nitrogen, and lastly phosphoric acid. But nitrogen has a value for early garden vegetables that chemical analysis does not show. Nitrogen forces early growth and gives large succulent leaves and stems. Potash gives solidity and crispness to stems and leaves and high colour to the fruit. Phosphoric acid gives plumpness and increases the sugar and starchy parts of seed and forces early maturity. A good general fertiliser for all garden vegetables, except beans and peas, would be the following mixture, per acre, but intensive market gardeners use two or three times as much:—

	lb.		lb.
Sulphate of potash	150	to	225
Superphosphate	250	to	375
Nitrate of soda	150	to	225

The fertiliser should be raked in just before the seed is sown.

For peas and beans the normal amount of potash and phosphoric acid may be doubled and the nitrate of soda reduced to 50 lb. per acre.

The sulphate is the best available form of potash for garden vegetables, as it contains no chlorides of salt, and does not make the soil cold. It also acts with especial favourableness on the starchy portion of vegetables. Fresh or water-slaked lime is always beneficial to garden soil.

IMPORTED AGRICULTURAL PRODUCE.

Do our agriculturists—that is comprehensively, the planters, farmers, orchardists, and horticulturists generally—realise what large sums of money are sent out of this colony to the southern colonies, New Zealand, and Tasmania, not to speak of America and the United Kingdom, for the purchase of agricultural produce which Queensland can raise from her own broad acres, and by so doing retain this money for distribution amongst themselves? If the question is asked: "What can Queensland produce?" the reply is: "The colony *can* produce all those articles, the products of the soil, which are required for the sustenance of a population numbering only 500,000 souls." But when we come to the question: "What *does* Queensland produce in quantities sufficient for the requirements of the people?" we are at once confronted by a question which can only be answered by an appeal to the official returns of the imports of agricultural produce from beyond her borders.

Taking the wheat production as the first item, the colony produced in 1897 some 1,009,293 bushels of wheat from 59,875 acres, an average of nearly 17 bushels per acre; and in the last season 600,000 bushels. The requirements for the colony amount to 2,800,000 bushels annually. Given good seasons and absence of rust, there is not the slightest reason why the average instead of the exceptional yield of wheat should not rise to 30 or even 40 bushels per acre on the splendid wheat lands owned by the Western farmers.

Even with a yield of 20 bushels, 140,000 acres would supply our present needs. That is to say that a little over double the acreage now sown would be equal to furnishing the colony's requirements in this respect. Six hundred farmers, each laying down an area of 250 acres of wheat, could meet the demand. Already, in 1897, our agriculturists planted maize on 109,721 acres. Of this much was cut for green fodder, yet the yield of grain reached 2,803,172 bushels valued at £300,000. Much of the land under maize-crops, however, being on the coast below the table-land, would not be suitable for wheat, but there are thousands of acres above the Range, from the southern border to the Central districts about Emerald, that are entirely adapted for wheat culture, and, as a matter of fact, every year sees many additional acres placed under the plough for this purpose.

It being conceded that we have the right class of farmers in the colony, that we have the land, and, as a rule, fair seasons, how does it happen that in one month alone (December, 1898) Queensland imported 26,457 bushels of wheat, of a value of £4,229, and that she must import during the year £300,000 worth, every penny of which might easily go into the pockets of the Queensland farmers? Now let us turn to maize. In the same year there were 109,721 acres under this cereal. The yield ranged from 40 to 100 bushels per acre, yet we obtained in the same month (December, 1898) 38,730 bushels, worth £6,969, from the southern colonies. It is the same with all other cereals, also with almost every product of the farm.

We grow 50 acres of onions, and we import 180 tons a month. The shortage in potatoes amounts to over £2,000 per month. With 391 acres of arrowroot we yet have to depend largely on foreign imports, whilst 311 acres of coffee leave us in the position of importing more than £7,000 worth yearly.

Fruit presents even greater anomalies. In round numbers 13,000 acres are planted with various kinds of fruit, yet the Customs returns for December last show that in that month Queensland was indebted to the south for 31,654 cases of green fruit and 39,017 lb. of dried fruits, the former being worth £5,793 and the latter £649.

Rice grows to perfection on our Northern rivers. Up to the present there are only between 400 and 500 acres sown annually, but our imports come to something like £8,000 per annum.

We ask the farmers, planters, and orchardists to study the statistics presented below, and they will then be in a position to realise what large sums which we pay to our southern neighbours and to foreign countries for produce which can and should be produced within our own borders.

Our sugar-planters have overtaken the colony's requirements; why should not our wheatgrowers do the same? There is no such expense attached to wheat-growing as to sugar-planting. Flour-mills can be built for one-tenth the cost of a very ordinary sugar-mill, yet we find that, in addition to wheat, we import nearly £11,000 worth of flour in one month.

It will be said that the returns of imports for one month are not a criterion of the imports for the year. That is so, but during some months some articles are imported in excess of others, and during others the figures are reversed, but the fact remains that in the last month of 1898 we imported agricultural produce to the tune of £35,538, the greater part of which should remain in the colony.

Return showing the Area of Land under Different Crops during the Year 1897.

	Acres.		Acres.
Wheat, grain	59,875	Gooseberries	108
Maize ,, ...	109,721	Lemons	46
Barley ,, ...	2,077	Mangoes	235
Oats ,, ...	1,034	Melons	124
Potatoes, English	8,197	Peaches	38
,, sweet	3,581	Peanuts	29
Arrowroot	391	Persimmons	27
Bananas	4,828	Plums	53
Pineapples	909	Strawberries	32
Oranges	2,196	Cabbages	182
Gardens and Orchards ...	3,878	Cucumbers	103
Coffee	311	Swede Turnips	44
Rice, grain	445	Tomatoes	96
Onions	50	Yams and Taro	201
Peas	36	Kafir Corn	17
Beans	10	Hay, Wheaten	5,898
Pumpkins	1,185	,, Barley	291
Apples	86	,, Oaten	14,002
Cocoanuts	510		

Return showing the Quantity and Value of the undermentioned Articles Imported from the Southern Colonies into the Port of Brisbane during the Month of December, 1898.

Article.	Quantity.	Value.
		£
Wheat	26,457 bushels	4,229
Maize	38,730 ,,	6,969
Barley	2,483 ,,	535
Oats	9,615 ,,	1,227
Flour	1,093 tons	10,731
Malt	2,866 bushels	973
Potatoes	261 tons	2,230
Onions	180 ,,	987
Hay	10 ,,	36
Chaff	55 ,,	184
Beans and Peas	683 bushels	171
Maizena and Cornflower	1,312 lb.	18
Arrowroot	564 ,,	7
Fruit, green	31,654 cases	5,793
Fruit, dried	39,047 lb.	649
Rice	153,916 ,,	744
Roasted Coffee	1,165 ,,	55
	Total ... £	35,538

Note.—The above figures are from statistics kindly supplied to us by the Collector of Customs.

Taking 50 bushels as the equivalent of this season's wheat of a ton of flour, the imports of breadstuffs for December, 1898, represent 54,650 bushels brought in in the shape of flour, and 26,457 bushels of grain, or a total of 81,107 bushels of wheat.

THE EXPANSION OF AGRICULTURE.

LOOKING back a hundred years, one cannot but be impressed with the marvellous strides which have been made in agricultural science since the day when Malthus wrote his "Essay on Population" (1798). At that time there was very little science in agriculture. The occupation was looked upon very much in the same light as it was in Anglo-Saxon and Norman days, when the tiller of the soil was a churl or a *vilein*, a mere clod-hopping animal whom God had specially created to minister to the wants of eorls, thanes, and barons. Up to as late as 60 years ago, farmers were spoken of as "jolly," "sturdy," &c., and were depicted as very fat men in top boots, baggy breeches, low, white, broad-brimmed hats, and on market days usually to be seen with a yard of clay in their mouths and quart-pots of beer in their hands. In fact, the British farmer was the type of "John Bull"—thick set, sturdy, aggressive, and very conservative. What is he to-day? Except in some Northern and Western districts, and in parts of Ireland, the farmer is not to be distinguished from any other man, except perhaps from a soldier, sailor, or clergyman. One of the reasons for this change is that the latter-day farmer has to work largely with his brains; another is that he has the assistance of various kinds of labour-saving machinery. No longer do we see hordes of men and women cutting down the golden harvest and binding it into sheaves. No longer is the rhythmetical "swish" of the scythe heard as the mowers, keeping time with each other, laid the sweet-smelling hay in long, regular swaths. The music of the flail in the barn does not any longer amuse the children "looking in at the open door." All is changed even to the sower who went forth to sow.

And how has production itself kept pace with the improved machinery, with the scientific discoveries tending to double or treble the produce of the land? It must be said that farmers are slow to adopt new ideas, although the old stubborn conservative has almost disappeared from the land, and the new generation is more amenable to reason and common sense. The vast estates of many of the old nobility and gentry in the old country have been let to farmers in greater numbers during the last hundred years. In newer worlds, large areas of virgin soil have been placed under the plough. Especially has this form of development taken place in the peaceable colonies of Australia. Many of the large freehold estates of the squatters have been subdivided into farms by the owners, or have been repurchased by the Government, and sold on easy terms, and at reasonable prices to the agriculturists, so that to-day we have the spectacle of large areas of the finest soil in the world, which were formerly considered as being only adapted to the raising of sheep and cattle, waving with splendid crops of wheat, maize, and lucerne, bringing in as many pounds per acre to the owners as they formerly brought in shillings.

If we consider the position of agriculture in Queensland only 38 years ago, and compare it with the state of the field industries of to-day, what a marvellous expansion is before us! In the early sixties the cultivation of the land was practically confined to the coast. All the magnificent Downs country was nothing but a collection of vast sheep runs. The total area under cultivation amounted to at most 3,250 acres. Sugar, cotton, rice, coffee, wheat were not even dreamt of. Most of the requirements of the colonists in the way of agricultural produce were drawn from foreign sources. Dairying was carried on here and there by some "cockatoo" farmers, who kept half-a-dozen ill-bred cows, and butter was imported in large quantities from Ireland. Bananas were only grown on the river banks, where other cultivation was impracticable. The State took no interest in the farmer. It was convenient to sell coast lands to him which were worthless for sheep farming at £1 per acre cash, but he was looked upon as a sort of necessary evil, and legislation was then directed to the expansion of the squatting industry rather than towards that of agriculture. By-and-by, however, came the American civil war, and an impetus was given to the cultivation of the soil in consequence of the demand

for cotton, which Dr. Lang had, long before separation, advocated as a crop which would succeed in Queensland. Almost simultaneously with the collapse of the cotton industry, owing to the cessation of that war, came the first attempts at sugar-growing, initiated by the Hon. Louis Hope, at Cleveland.

Gradually this industry was taken up and spread over the Southern portion of the colony, until sugar became one of the great factors in the building up of the agricultural interest. With one or two serious checks, this industry has grown to its present grand proportions. Then came the wheatgrower, who made his tentative efforts on the Downs. By degrees, as it was found that that country was suitable for its cultivation, wheat established itself, and eventually, as estates were cut up and sold, more men went in for wheat-growing, until to-day the tablelands above the Range produce nearly 1,000,000 bushels annually. In the same manner expansion has taken place in the dairying business.

The old order has passed away. Dairying has become a science; creameries and factories exist in all farming centres; no longer is butter imported into Queensland; the colony has become an exporter of this commodity. Fruit is now grown in quantities from one end of the colony to the other, and oranges and bananas, together with other fruits, form a regular article of export to the southern colonies. With irresistible force agriculture is pushing its way ahead. Every assistance is afforded to farmers and horticulturists by the Government to enable them to obtain cheap and good land on easy terms of payment, to assist them to combat the various difficulties under which they labour, to enable them to find markets for their produce by reducing the cost of carriage to the coast, by pushing out railways into the established centres of agriculture and towards the rich lands of the interior, and by lessening the burden of taxation on agricultural machinery.

Favoured in this manner, new lands are daily being placed under cultivation, and new phases of agriculture are coming to the front. Coffee and rice have already passed the experimental stage. Ramie and other fibres are being experimented on, and will ere long become items in our exports. Land under cultivation has risen from 3,250 acres in 1860 to over 225,000 acres in 1899. The magnificent plains of Central Queensland, the rich scrubs of the Northern coasts, are rapidly being brought under the plough, and what is now required is population—a population of yeoman farmers to carry on the work. Queensland with barely 500,000 souls presents to-day a picture of agricultural prosperity which is simply astonishing, and there is room for many more thousands. These 500,000 people own 130,000 head of dairy cattle and 100,000 swine. They produce between 5,000,000 and 6,000,000 lb. of butter and 2,000,000 lb. of cheese annually, and 6,000,000 lb. of bacon and ham. They turn out 150,000 tons of sugar, 1,000,000 bushels of wheat, 13,000 bushels of rice, 3,000,000 bushels of maize, 81,000 lb. of coffee, 16,000,000 dozens of bananas, 6,000 cwt. of tobacco, 200,000 gallons of wine, 5,000,000 lb. of grapes, 1,500,000 dozens of pineapples, and yet have to import £300,000 worth of agricultural produce annually. Here then we see that there is room for a large expansion in agriculture. Here is an opportunity for thousands of good men to make comfortable homes for themselves and their families, and to build up a nation of Anglo-Saxons which shall stand out as a bright and unique example of what the British and Teutonic races are capable of accomplishing under the wise and equitable laws of British rule.

The progress of agriculture in Queensland can best be gauged by a perusal of the table here given. In the early days of the colony the various districts were not so clearly defined as they are to-day, for the country had only just emerged from the chrysalis stage in the leading strings of New South Wales, and was only on the eve of developing into the fully matured butterfly. During 1880, and in previous years, no distinction was made in the acreages of English and sweet potatoes, both being included under one head; hence they are so included in the table of statistics for those periods.

It must be understood that the figures here given for each district are very comparative for the reason we have stated.

Comparison of the Acreage under Certain Crops, during the Years 1860, 1880, 1897. From Statistics Compiled by the Registrar-General.

—	Moreton District.			Toowoomba District.			Warwick District.		
	1860.	1880.	1897.	1860.	1880.	1897.	1860.	1880.	1897.
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
Wheat (Grain) ...	23	199	1,059	16	2,941	20,196	153	7,613	29,326
Maize ,, ...	897	24,184	5,329	162	5,630	14,282	383	3,780	20,483
Barley ,, ...	5	266	149	1	998	918	6	171	824
Oats ,, ...	1	15	45	...	53	795	5	22	35
Millet, &c.	21	41	1,784	1	215	745	8	35	486
Potatoes, English	195	3,161	4,645	65	861	921	53	572	796
,, Sweet			1,574			2			
Bananas	...	224	1,406						
Arrowroot	...	132	386						
Cotton	2	419	45						
Dry Fodder (Hay) ...	95	3,832	19,997	2	1,967	9,442	169	4,471	13,162
Green ,, ...	255	6,286	5,548	...	3,300	5,127	4	3,916	2,332
Gardens	356	810	1,243	15	306	594	43	192	437
Vineyards	...	264	708	...	130	216	...	111	218

These figures speak for themselves, as will also those in the following table, which presents a vivid picture of the expansion of agriculture, especially in the year subsequent to 1877:—

Land under Cultivation during the Period extending from the Year 1860 to 1897.

	Acres.
1860	3,351
1861	4,440
1862	6,067
1863	11,262
1864	12,006
1865	14,414
1866	24,433
1867	31,559
1868	39,321
1869	47,034
1870	52,210
1871	59,969
1872	62,491
1873	64,218
1874	70,331
1875	77,347
1876	85,569
1877	105,049
1878	117,489
1879	106,864
1880	120,881
1881	120,075
1882	158,686
1883	167,476
1884	199,580
1885	209,130
1886	221,843
1887	205,737
1888	214,002
1889	247,073

	Acres.
1890	239,618
1891	258,004
1892	260,828
1893	252,075
1894	284,552
1895	299,278
1896	336,775
1897	386,259

The dairying industry, which is not touched on here, has expanded to even a greater extent; in fact, it is to the growth of this business that much of the increase in the acreage under crop for hay is due.

ENSILAGE.

Professor Massy, of the North Carolina Experimental Station, U.S.A., says:—In making ensilage we long ago found that the pressure and tramping was not only of no use, but a positive detriment to the food. As long ago as 1886 I abandoned any effort to compress silage in the silo, finding that we had better results from allowing the mass to settle of itself, simply keeping the whole level and well pushed into the corners as filled in. I next abandoned the placing of a wooden cover over the top, finding that I got better results from a mere covering of cut straw; in fact, the silage will make its own cover as the mould spreads through the top layer, but it is better to make this of some cheaper material. In fact, we find that with a silo tight at sides and bottom it is easier to make good silage than to spoil it. The array of screws, ropes, and presses illustrated in some Australian journals is all expensive and useless. We find, too, that a wooden silo above the ground is far better than any stone or brick building either under or above the ground. The waste from decay of silage in stacks will soon pay for a building, and we do not favour the stacking. All we want is a building, no matter how cheap, and into this we cut the corn when fairly eared. We cut slow or fast as suits our convenience, stopping if need be a day or two at a time, but never stopping because of rain, for we have cut when it was dripping wet, and had the best of results. We keep one man in the silo to level the mass as cut, but do not allow any tramping that can be avoided. When full, we cut a thin layer of straw over all, and the work is done.—*Australian Pastoralists' Review.*

AGRICULTURAL EDUCATION IN THE UNITED STATES.

The institution of Agricultural Colleges in the United States was attended with many difficulties, all of which have been triumphantly overcome. As early as 1858 Mr. Justin S. Morrill, a member of Congress, introduced a Bill providing for such institutions, but it was vetoed. Four years later a similar measure was approved of by President Abraham Lincoln, and by this Act 11,000,000 acres of land were divided amongst the several States, 30,000 acres being given for each representative in Congress. New York received 990,000 acres, some of the smaller States receiving only 90,000 acres.

Professor W. H. Henry, of the Wisconsin College of Agriculture, gives the following interesting account of the establishment and working of the colleges, which is published in the *Breeders' Gazette*, Chicago:—

In his plea Mr. Morrill pointed out the fact that rich men out of their abundant means had provided schools for the education of those who were to follow the professions, while no one had made provision for the higher education of the children of the industrial classes on which the nation must rely for its strength and support. Since no one had cared for these, he argued, it was the duty of the General Government to make liberal provisions in the way of schools for technical training. He especially urged this from the agricultural

standpoint. The manner in which the grants were received, bestowed, and disposed of would make a book. Out of this grant was founded the great Cornell University. Michigan gave hers to her agricultural college, already located at Lansing. Illinois founded a new institution at Champaign, Iowa a college at Ames, Indiana gave hers to Purdue, and Wisconsin and Minnesota to their State Universities.

In many cases the magnificent gift was frittered away in the most senseless manner, if stronger words would not better characterise the operation. Some States carefully conserved the grant and showed good judgment. Cornell University, Michigan, and Iowa, with others, are on the list of States that wisely conserved what the Government gave them. Wisconsin, Illinois, and Kentucky are among the States that did poorly with the gift. In 1889, when he saw that the income from the land grant was far less than had been anticipated, Senator Morrill introduced a supplementary Act by which the States receive 25,000 dollars annually from Government land sales to strengthen and supplement these industrial institutions.

More than a third of a century has passed since their founding, and we can now look back and see the crude conditions and the many mistakes which necessarily follow such a sudden giving of an immense grant. In most of the States the people were not ready for an agricultural college, and the farmers cared nothing about it, so that those classically inclined and who were familiar with educational effort easily warped the funds in directions not contemplated by the originators. It is not too much to say that in those times there were very few indeed who knew what an agricultural college should be in equipment or curriculum. And even had this been known there were not the teachers available to impart the instruction. And, further, had there been both there would not at first have been pupils to be taught. Our country was too new, agriculture too crude, and the farmers too busy taking up Government land and skimming the fertility off its surface to care anything about agricultural education. With the marked changes rapidly coming on the whole situation is assuming a new phase. Our agricultural colleges are growing in strength and equipment, men are preparing themselves specifically for the work and learning what and how to teach. As these come on, the young men from the farm are turning their faces to these educational institutions, fully appreciating the great advantages which may accrue to them from the offered instruction. In working out this great problem of agricultural education in America there has been an enormous sacrifice of money, energy, and effort, but at last we are getting down to business as we should.

It is but natural that over such a wide expanse of country, where so many different conditions and views on education prevail, our agricultural colleges should take on a wide diversity of effort, and that their success should vary greatly. At first the courses of instruction were almost wholly scientific in character, not differing materially from that given the engineer or the professional man, the only addition being a smattering of agriculture often unworthy of the term. This was because there were neither the teachers, the pedagogical methods, nor the equipment necessary. Year by year our agricultural colleges have grown more agricultural and more practical. The amount of real training in agriculture in the direction of agriculture which one can gain at any of our leading institutions is now very considerable in amount, and usually of excellent quality. We are slowly but surely learning what to teach in agriculture and how it should be taught.

In our State universities the four-year course in agriculture is usually a combination of true scientific training with more or less agricultural instruction and practice. Sometimes it is about all science, but generally there is considerable agriculture. Those graduating from these long courses usually do not expect to go back to the farm, but look for positions in the Department of Agriculture at Washington as instructors in agricultural colleges or workers in experiment stations, or choose to follow some technical line in advance, as they suppose, of the straight occupation of farming.

It is of a recent phase of agricultural educational effort that I desire to speak particularly at this time. A number of institutions, goaded by the charge that they had no pupils, endeavoured to meet the farmers by giving practical short courses of instruction. With some, such courses were a mere "tub to the whale"—something given to allay grumbling and discontent. With others it was an earnest effort to get down to farmer conditions and teach young farmers something about farming. At the University of Wisconsin, for example, we could not get the young men to take the long course in agriculture, while we found that they would come to study in what is called the short course. Instruction was offered for 12 weeks during the winter, when the young farmers could best be spared from the farm. Thirteen years ago this effort was begun with nineteen pupils. This year sees over 300 pupils studying agriculture at the University of Wisconsin. Our course of 12 weeks has grown to two winters of 14 weeks each. Creamery and cheese factory operations are taught as a separate branch covering 12 weeks. As the farmers learn of the school and what it can do for their sons, our attendance increases. As we strive to teach real agriculture and as we improve our equipment and facilities generally, our numbers increase. In this course we teach nothing but agriculture and pay no attention to the previous general training of the students, holding that they should remain in a country district school until they have completed that course. These young men are daily drilled in the feeding, breeding, and management of live stock, the cultivation and management of crops, construction and ventilation of farm buildings, the care and management of gardens and orchards, farm blacksmithing, farm carpentry, &c. More than a score of teachers give their whole energies to these lines of instruction.

A more eager, earnest set of young farmers can nowhere be found. They have come directly from the farm, and they will return to it in March next. It is interesting to note that, in the case of our Wisconsin school, probably 40 per cent. of the young men studying with us in the farm courses will hire out on farms next spring as farm hands. The call for these young men is beyond our ability to supply. Farmers write us that they want one or more young men who have attended our school the coming season to work on their farms, saying that they prefer our students because they are industrious, temperate, and they can have them sit at their own tables without being ashamed of them, or having them influence the younger members of the family unfavourably through bad habits, bad manners, &c. Last spring, at the end of the short-course term, we hired out fifty-one of these farmer students within two weeks' time, and had many more calls than there were young men seeking places. These young men found places from Massachusetts to California.

The University of Minnesota, in the desire to get nearer the farmers, has hit upon a happy line of effort. Here the students spend three winters of six months each in pursuing academic studies, combined with agriculture and the domestic sciences. Thus their common school education is increased, and they are kept near the farm and the home in thought and training. A total attendance of about 400 plainly attests the wonderful popularity of this institution among the farmers of the State, and shows how wisely the university authorities have planned. I believe that the experiences of Minnesota and Wisconsin, added to the work of such institutions as Michigan and Iowa, show plainly that in all the older agricultural States at least by properly studying the needs of the farming class a large attendance can be secured at the agricultural college. Each State must work out the problem to suit its particular condition, for no doubt they vary more than one would suspect from a cursory examination.

In the 18 years' work given to building up the College of Agriculture at the University of Wisconsin, I have become more and more impressed with the necessity for making agricultural instruction intensely practical. I hold that when the teacher properly understands his work this practical instruction can be scientific and normal in every particular, and that it is only through

ignorance and lack of appreciation of the true situation that there is any warfare between the scientific and the practical. True practice is based on science; and the more intensely scientific we are, the more are we practical.

Again, I have been deeply impressed with the heavy cost of real agricultural education. Such instruction can be imparted only in a small measure in lectures. Each student must receive individual training and be closely watched over by expert instructors. It is easy to "lecture a class to death"; it is difficult and expensive to give them that kind of instruction which they can use in their every-day farm operations at home, and which will make better practical farmers of them.

Readers of the *Gazette* generally, I am sure, will declare their willingness to stand by their agricultural colleges. This moral support is all right and good as far as it goes. Now, are they willing to give it the financial support needed? A day's training for the young farmers, properly given, will cost much more than a day's training for the lawyer or the scientific student, for the farmer must have before him expensive apparatus and living plants and animals with which to work. These are costly in the first instance, and are expensive to maintain. The lawyers can be taught in large classes. The farmer student must have individual assistance. Will our farmers who say they give their agricultural colleges moral support see to it that they are properly equipped in library, laboratory, field, and stable? Our teachers are rapidly learning how to teach practical agriculture; will our farmers whose sons are to receive this instruction strengthen these teachers with the moral and financial support they so much need?

PROFIT IN WHEAT FARMING.

That South Australian farmers should so persistently adhere to wheat-growing, in the face of the small average yield obtained by them year after year, excites the surprise of farmers in other colonies, where the yield ranges from 10 to 40 bushels per acre, with average crops throughout of from 17 to 30 bushels per acre.

When we come to look into the matter from a pounds, shillings, and pence standpoint, the persistence of the South Australian is not so remarkable. The whole thing resolves itself into the question of cost of cultivation, cost of harvesting, and cost of freight. Now, before we place before our readers the statistics of Australian production, let us see what is being done in the United States of America. We in Australia are accustomed to look a great deal to that country for hints and wrinkles which may assist us to obtain the maximum of profit at a minimum of expenditure.

Mr. Shelton, late principal of the Queensland Agricultural College, has time and again shown how the Kansas farmers, and also the farmers of other States, manage to live comfortably on the proceeds of their wheat crops. We do not recollect that he has at any time given us the experience of the Dakota farmers. We therefore place before our readers the position of the farmer in that wheat-growing State.

A correspondent of the *Agricultural Gazette*, London, writes thus:—

CHEAP FARMING IN DAKOTA AND ITS RETURNS.

It is surprising that farmers in new countries should be satisfied with the miserably small crops which they obtain under their system of extensive cropping. One who farms in South Dakota, and is considered a sufficiently good example of his district to have his methods fully described and illustrated in the *Rural New Yorker*, admitted that his yield of wheat averaged only 6 bushels an acre. He cultivates 300 acres of land, using the most modern of labour-saving implements, and makes his cost of cultivation extremely small. The cost of labour from first to last he makes 3s. 1½d. per acre; 1 bushel of

seed is put at 2s. 1d., and interest on the value of the land at 3s. 1½d., making within 12s. 5d. per acre, without allowing anything for taxes or miscellaneous expenses.* His 6 bushels of wheat per acre have brought him in this season only 12s. 6d., so that his crop has only paid working and other expenses. Indeed, there must be some small expenses not covered by the 12s. 5d. As this farmer does a great deal of the work himself, he says that his crop has just paid him good wages. In other words, the farmer of 300 acres is satisfied to earn the wages of a farm labourer. What the English farmer cannot understand is why his American friends should take the trouble to crop so many acres with wheat for such a miserable result. A good farmer in this country frequently grows as much wheat on 45 acres as the South Dakota farmer produces on 300 acres. Possibly the latter could not grow as much per acre as the former, however well he farmed, soil and climate being different; but it is feasible to grow the 1,800 bushels on 100 acres in Dakota, and to leave the remaining 200 acres for grazing, if nothing better can be done with it.

Now, turn we to our own country—Australasia; and that we may not be charged with picking out any one good year, we will consider the wheat yield of the whole of the seven colonies for the 10 years when wheat-growing was coming to the front—from South Australia to Queensland.

With this view we present the following table :—

Average Yield of Wheat per Acre in the Seven Colonies from the Year 1885 to 1894.

Colony.	Average Yield per Acre. Bush.	lb.
New South Wales	12	0
Victoria	9	9
Queensland	14	9
South Australia	6	8
Western Australia	11	7
Tasmania	17	4
New Zealand	23	7

The average yield for the seven colonies during a period of 10 years is thus 13 bushels 15 lb. per acre.

We will now take the years 1890 to 1898 for the colonies of South Australia and Queensland :—

South Australia.

Year.	Average Yield. Bush.	lb.
1890-91	5	37
1891-92	4	41
1892-93	6	41
1893-94	8	8
1894-95	4	52
1895-96	4	22
1896-97	2	46
1897-98	3	45

Queensland.

Year.	Bush.	lb.
1890-91	20	19
1891-92	14	58
1892-93	14	32
1893-94	14	32
1894-95	19	29
1895-96	9	33
1896-97	17	20
1897-98	15	0

* Some other expenses must come to 4s. 1d. in order to arrive at a total cost of 12s 5d. per acre.—Ed. *Q.A.J.*

The average returns per acre, then, are—For South Australia, 5·6 bushels; for Queensland, 15·43 bushels.

From this it would appear either that the South Australian farmer is working at a dead loss or that the Queensland farmer is in a most enviable position.

We must, however, take into consideration the cost of production.

The Dakota farmer abovementioned has realised sufficient probably from his harvest to about pay the cost of production, but he is his own labourer; therefore he is satisfied that he has made farm labourer's wages. But would a South Australian or Queensland farmer feel that he was on the highway to prosperity if he only made as much as he could have earned by going out as a day labourer? Scarcely. Then it behoves us to elucidate how the South Australian can live comfortably on an average yield of between 5 and 6 bushels, and the Queenslander on 15 to 16 bushels, whilst the Dakota man only makes bare wages.

To get at the bottom of this anomaly, we have to consider the cost of production, the cost of labour, and of living. The Dakota farmer puts in and takes off his crop at a cost of 12s. 5d. per acre, but he has other expenses which will probably bring his debit account up to 13s. As he only receives 12s. 6d. for his 6 bushels of wheat, he is working at an actual loss of 6d. per acre, but, throwing his own labour into the scale, he says he is making wages.

What about the Queensland and New South Wales farmer? We present another table showing the cost of production in those colonies. We do not give these figures as absolutely correct, but merely as a fair approximation of the cost:—

—	Ploughing, Sowing, Seed, Horsefeed, Repairs, &c.	Cost of Harvesting, from Stripper to Buyer.	Total Cost.	Yield.	Price per Bushel.
	s. d.	s. d.	s. d.	Bushels.	s. d.
1894	8 2	5 11	14 1	11⅔	2 0
1895	7 6	5 1	12 7	7½	4 0
1896	12 6	5 9	18 3	10	4 4½
1897	11 7	6 5	18 0	11⅔	3 7
Averages ...	15 9	...	...	10¼	3 6

Net return, £1 0s. 1d. per acre.

Thus we see that a yield of 6 bushels per acre in Dakota only clears the cost, if even it does that, of one man's wages, whilst in New South Wales a return of little over 10 bushels will give a net profit of £1 0s. 1d., whence we may deduce the corollary that a return of 5 bushels in South Australia, where the most approved labour-saving appliances are in use, a profit of more than half that amount will result. A man planting 300 acres of wheat will have over £300 to his credit for his crop in the south. But the Queensland farmer possesses the advantage of clearing this profit on his wheat, and then of getting a similar return for the maize subsequently sown on the same land.

Mr. P. Hagenbach, a wheat-grower at Warwick, in his paper on "Wheat-growing on the Darling Downs," read before the Agricultural and Pastoral Conference held at Rockhampton on 11th, 12th, and 13th May, 1898, said the profit on wheat-growing, after paying every possible expense, amounted to £2 4s. 1d. per acre, reckoning an average return of 20 bushels of wheat at 4s. per bushel.

We have said enough to show that wheat-growing is a most profitable occupation in Queensland, even reckoning the cost of producing and marketing to be over £2 per acre. In South Australia the methods of cultivation make the expenses far lighter; but, after all, the returns can barely pay more than the actual labour of the farmer and his family.

Dairying.

HOW TO TELL THE ACIDITY OF CREAM.

The most satisfactory test for estimating the percentage of lactic acid in milk cream, skimmed milk, or whey, is known as the "titration test," and to apply it you must be free from colour-blindness. The appliances needed are—

One 50 c.c. burette, with glass tap
One burette stand
One 50 c.c. test measure
One piece of glass rod
A glass tumbler or white teacup
1 oz. alcoholic solution of phenol phthalein (1 in 500)
½-gallon decinormal solution of caustic soda (4 grammes of pure caustic soda to 1 litre distilled water).

You take a sample of milk or cream after it has stood at least half-an-hour, and is at or near the temperature of 60 degrees Fahr. Shake the whole, to get a fair sample. Measure 50 c.c., and transfer to the tumbler or teacup. You should wash out the measure with water, so as to get all the milk or cream, and add that to the sample. Into this stir with the glass rod six drops of the indicator or phenol phthalein solution. Fill the burette up to 0 with the decinormal solution of alkali. Turn the tap, and allow it to flow or trickle slowly on to the milk or cream containing the indicator. Keep up a brisk agitation with the glass rod. A bright pink colour develops as soon as the alkaline solution reaches the milk, but as rapidly disappears as the stirring is maintained. A point, however, is reached when the pink colour becomes permanent, and is observed throughout the milk or cream. Turn off the fluid quickly by means of the tap, and then read off the register of the burette the exact amount of alkaline solution in cubic centremetres that is required to produce this effect. This permanent colour shows the exact point at which the alkali neutralises the lactic acid, and provides an essential factor in estimating the percentage of acidity. Each cubic centremetre of alkaline solution will neutralise ·009 lactic acid, hence the formula for calculating the result. Say, for instance, that the milk sampled became neutral with 12 c.c. of solution, then—

$$\frac{12 \times \cdot 009}{50} \times 100 = \cdot 216 \text{ per c. lactic acid.}$$

The principal point to keenly watch is the exact time at which the permanent pink colour permeates the milk or cream, and to smartly shut off the alkaline solution. Dexterity in this direction means more accurate determinations.

DISCUSSION ON A DAIRYING PROBLEM.

The Kansas State Board of Agriculture lately submitted a number of questions on dairying to several experts in America, with the view of gaining from their experience information on several points interesting to those who are engaged in the dairying industry. We append some of the answers to the following question:—

What quantity of butter or cheese ought a cow to yield in a year to be rightly regarded as profitable for the dairy?

Hoard.—Not less than 250 lb. of butter or 500 lb. of cheese.

Haecker.—300 lb. of butter and 500 lb. of cheese.

Wallace.—At least 200 lb.; strive for 300 lb.

Wilson.—It depends upon locality and cost of feed; 200 lb. is tolerable.

Dean.—The standard of production in our dairy is 6,000 lb. of milk, or 250 lb. of butter, or 600 lb. of cheese.

Wing.—Of butter 250 lb., and cheese 625 lb.

Goodrich.—250 lb. of butter, or 570 lb. of cheese, though 200 lb. of butter or 450 lb. of cheese would probably pay for the keeping and work.

Alvord.—From 250 lb. to 300 lb. of butter, and 550 to 600 lb. of cheese.

Gurler.—The minimum of butter should be 250 lb.; of cheese, 600 lb.

Gould.—Of butter, 250 lb. and above; of cheese, 600 lb. and above.

Curtiss.—Not less than 200 lb. of butter, or 350 lb. to 400 lb. of cheese.

Dodge.—Of butter, 250 lb. to 350 lb.

Dawley.—This depends much on the cost of keep and the prices of the product. I cannot afford to keep a cow that makes less than 300 lb. of butter per year, and I set the standard at this and 5,000 lb. of milk.

Mathieson.—Not less than 250 lb. of butter or its equivalent in cheese.

Carlyle.—A good dairy cow not above average size should produce, when liberally fed and carefully managed, at least 250 lb. of butter or from 500 lb. to 600 lb. of cheese annually.

Adams.—It depends on the cost of feed. Ordinarily the minimum should be 250 lb. of butter and 500 lb. of cheese.

Boardman.—The value of feed and the price of butter would enter in, but I would not consider a cow that produced less than 250 lb. of butter per year profitable enough to be permanently retained. The mark should be for 300 lb. or more.

Monrad.—250 lb. of butter, aiming at 300 lb.; cheese, 550 lb. to 650 lb.

Professor Robertson.—500 lb. of cheese, or 200 lb. of butter, under extensive rather than intensive dairying.

Fraser.—In her prime, 250 lb. of butter.

Brandt.—Butter, 250 lb, and up to as much more as she will make.

Morgan.—In Kansas, 150 lb. will pay under present conditions; this is about the average production of butter per cow for Kansas; am not posted as to cheese.

Nissley.—About 275 lb. of butter.

Jones.—From 250 lb. to 300 lb. of butter, and 500 lb. to 600 lb. of cheese.

Eyth.—Not less than 200 lb. of butter, or 450 lb. of cheese.

DWARF CATTLE.

THE newest breeds of cattle coming to the Dexter Kerries, that were landed with the first batch of Government imported dairy cattle, are the Cingalese cattle. They are known to zoologists as the "sacred running oxen." They are the dwarfs of the whole ox family, the largest specimen of the species never exceeding 30 inches in height. One which is living, and is believed to be about ten years of age, is only 22 inches high and weighs 109½ lb. In Ceylon they are used for quick trips across the country with express matter and other light loads; it is said that four of them can pull a driver of a two-wheeled cart and a 200-lb. load of miscellaneous matter sixty or seventy miles a day. They keep up a constant swinging trot or run, and have been known to travel 100 miles in a day and night without either feed or water. No one knows anything concerning the origin of this peculiar breed of miniature cattle. They have been known on the island of Ceylon and in other Buddhist countries for more than 1,000 years.

HOW TO DEHORN CALVES.

STICK caustic potash is the medicine. The earlier the application is made in the life of the calf, the better. The hair should be clipped from the skin, and the little horn moistened with water, to which a few drops of ammonia have been added to dissolve the oily secretion of the skin, so that the potash will

adhere to the surface of the horn. Take care not to moisten the skin, except on the horn where the potash is to be applied. One end of the stick of caustic potash is dipped in water until it is slightly softened. It is then rubbed on the horn. This operation is to be repeated from five to eight times, until the surface of the horn becomes a little sensitive. If done carefully, a slight scab forms over the surface of the budding horn. No inflammation or suppuration of any account need follow. The case in favour of dehorning is thus stated in the *American Agriculturist* by a correspondent, who has put the matter to the test:—All evidence goes to show that dehorning subdues the animal, removes all restless or turbulent disposition, and replaces viciousness with docility. This is most pronounced in the case of bulls. A marked difference is noticed in the entire herd. Instead of chasing, goring, and butting, the animals walk along quietly in a body like a flock of sheep, and have no more desire to molest than they have to be molested. This is of especial value when passing through lanes and gates, where, with horned cattle, much injury is likely to be done. At the watering trough, instead of one or two standing guard and preventing the approach of the weaker cattle, all crowd in together and proceed at once to satisfy their thirst. As many as eighteen dehorned animals have been seen to drink from a trough 8 feet in diameter. It would be dangerous for half-a-dozen to do so if they had horns. Such altered conditions are advantageous alike in dairying and fattening stock, the sense of quiet and security enabling the animals to better assimilate their food, and thus give a larger and richer yield of milk as well as show more rapid improvement in laying on flesh.

SOME PIG-FEEDING EXPERIMENTS.

During the past year two interesting experiments in pig-feeding were carried out by the Agricultural Department of the University College, Nottingham (with which is affiliated the Midland Dairy Institute, Kingston, Notts), at the Midland Dairy Institute Farm, Kingston. One experiment was undertaken to ascertain (1) the relative feeding value of separated milk and whey respectively when fed to pigs along with maizemeal; (2) whether it would be more profitable to sell the whey and separated milk direct from the dairy or to use it for fattening pigs (the price obtainable being ⅓d. per gallon for whey and 1d. per gallon for separated milk); (3) which of the following rations would be most profitable for feeding pigs:—Maizemeal and water, maizemeal and whey, or maizemeal and separated milk, if the same pecuniary value of three mixtures were used.

The whey and separated milk were valued at a price which could have been obtained if they had been sold to farmers and pig-keepers in the neighbourhood, the maize at the actual cost delivered to the institute.

The trial lots of pigs were made up from three litters, and from each litter six pigs were taken and divided equally amongst the three lots, making six pigs to each lot. This was done to secure uniformity in fattening propensities.

The rations at first used consisted of the foods in the following proportions, fed to each lot of six pigs:—

—	Total Ration per 6 Pigs.	Ration per Pig per Day.	Total Cost of Ration per 6 Pigs.	Total Cost of Ration per Pig per Day.
			s. d.	d.
Lot 1 ...	32 lb. maizemeal; water *ad lib.*	5⅓ lb. maizemeal; water *ad lib.*	1 4	2⅔
Lot 2 ...	20 lb. maizemeal; 6 gallons separated milk; water *ad lib.*	3⅓ lb. maizemeal; 1 gallon separated milk; water *ad lib.*	1 4	2⅔
Lot 3 ...	24 lb. maizemeal; 12 gallons whey; water *ad lib.*	4 lb. maizemeal; 2 gallons whey; water *ad lib.*	1 4	2⅔

Note.—The maizemeal was scalded and allowed to soak for a few hours before giving to the pigs, and was fed along with the liquids.

After 20 days the quantities of maizemeal were increased by 1 lb. per head per day, bringing the cost of ration per pig per day up to $3\frac{1}{6}$d.

The following table shows the net profit on feeding :—

—	*Value of Pigs when Put up to Feed.	Value of Carcasses after Feeding.	Cost of Food.	Profit on Feeding per Lot.	Profit on Feeding per Pig.	Cost of Putting on 1 lb. of Carcass Weight per Day.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	s. d.	d.
Lot 1—6 pigs	15 0 0	23 8 2	4 11 7	3 16 7	12 9	3·12
Lot 2—6 pigs	14 10 0	23 13 0	4 11 7	4 11 5	15 3	2·84
Lot 3—6 pigs	15 5 0	25 15 0	4 11 7	5 18 5	19 9	2·48

NOTE 1.—*These values are arrived at by estimating 75 per cent. of the unfasted weight at the price mentioned.

2.—The prices are taken at 6s. 8d. per stone, being the value realised on the sale of the pigs.

3.—The above table assumes that the manure made is set against the cost of attendance and litter.

The report of Mr. T. N. Parr, of Nottingham, who purchased the pigs, states that the maize alone fed pigs exhibited big leaf, thin on the belly, while the back was thick and fat. The flesh also was soft and did not set well. Between the "maize-separated milk" and "maize-whey" fed lots there was little to choose, both lots showing less leaf and thicker on the belly, and with a good proportion of lean. If anything, the maize-whey lot were firmer in flesh, which was as he expected.

It appears that 1 gallon of separated milk and a little less than 2 gallons of whey are equal in value for pig-breeding purposes ; that it is much more profitable to turn the skim milk and whey into pork than to sell it at the prices obtainable—viz., 1d. per gallon for separated milk and $\frac{1}{3}$d. per gallon for the whey ; that where separated milk and whey can be purchased at the prices named, and used to supplement the same value of maize, the quantity and quality of pork will be greatly increased, without any increase in the cost price.

As to feeding value, the maize and whey ration stood first, maize and skim milk second, the maize alone ration being very far behind.

It must be admitted that these experiments were carried out under the most favourable circumstances. The three lots of pigs were of grand quality, and in thriving condition when the experiment commenced ; the weather was mild, pork was making a good price, and maize was reasonable to buy. Under less favourable circumstances the profits made would not have been so high, but this would not have altered the relative feeding values of the foods given.

It is interesting to note the quantity of meal required for each lb. increase in live weight. If we take Lot 1, we find that during the whole period of 60 days each pig consumed 360 lb. of meal, which works out at 5·2 lb. of meal required to make 1 lb. increase in weight.

The other experiment was undertaken to ascertain the relative values of barley-meal and maizemeal as "pig foods" when fed in equal weights, together with equal quantities of whey.

For the experiment two lots of pigs of four in each lot were taken from the same litter.

The rations used, cost of food, &c., will be seen by the following table :—

—	Ration per Pig per Day.	Total Ration for 4 Pigs per Day.	Total Cost of Ration for four Pigs per Day.	Cost of Ration per Pig per Day.
			d.	d.
Lot 1 ...	Barley-meal and whey : Barley-meal, 5 lb. ; whey 2 gallons.	Barley-meal, 20 lb. ; whey, 8 gallons.	14·24	3·56
Lot 2 ...	Maizemeal and whey : Maizemeal, 5 lb. ; whey, 2 gallons.	Maizemeal, 20 lb. ; whey, 8 gallons.	12·64	3·16

Note 1.—The value of barley-meal at the institute at the time was £5 8s. per ton, the value per lb. being ·58 of a penny.

2.—Value of maizemeal at the institute was £4 13s. 4d. per ton. This is equal to ½d. per lb.

3.—The value of whey for pig-feeding is reckoned at ⅓d. per gallon (being the amount realised had it been sold).

After feeding for 20 days on the above rations, the quantities of meals were increased by 1 lb. per pig per day for the remaining 43 days, bringing the cost of rations up to 4·14d. per pig per day for Lot No. 1, and 3·66d. each for Lot No. 2.

The report of Mr. T. N. Parr, of Nottingham, who purchased the pigs, was to the effect that the barley-fed pigs were leaner in flesh and set better than those fed on maize. The flesh of the maize-fed pigs was fatter than those fed on barley, but set nicely and was of good quality and very suitable for the pork trade in which he is engaged.

The barley-fed pigs would have been better for the "curing trade," but it is very doubtful whether such an increase in price could have been obtained to compensate for the extra cost of producing the better quality pig.

From the above it will be seen that in fattening pigs some 6 months old, maizemeal is a more profitable food for the production of pork than barley-meal (when feeding stuffs cost about the prices quoted), and that maizemeal produces greater weights of increase than barley-meal.

Although the pigs fed on barley-meal produced the firmer and better quality pork, yet, as long as the butcher makes no difference in price for the two differently fed pigs, it will be noticed that more weight of pork can be produced by the use of maizemeal, and that at a cheaper rate than employing barley-meal in the same quantities.—*Agricultural Gazette* (London).

HINTS FOR PIG-BREEDERS.

Cleanliness of the quarters allotted to swine on a farm is usually a well-neglected quantity. There is scarcely a farmer, probably not one, who in a discussion on pig-raising will not declare that the sties or pens must be kept clean, that pigs require as much attention as sheep or horses, and that their food should be regulated in the same manner as for the latter quadrupeds. But when we visit the farms of these theorists, what do we find? The pigs wallowing in filth, the sties belly-deep in mud in dry weather, the food thrown into them on this substratum of dirt, or else poured into a sour trough which is never cleaned out. Can men not understand that the pig is no more a filthy animal than its owner? A duck is far dirtier in its habits than a pig, yet poultry-keepers are careful to look after the comfort of the duck, both as regards its quarters and food.

Supposing we were to treat our horses and cattle as pigs are treated, we should annihilate them by disease in one act. Why then single out one of the most valuable and one of the least expensive of domestic animals for such treatment as we see the pigs subjected to?

Pig sties may be arranged in many ways, but one great desideratum is—perfect drainage. Those farmers who are able to do so, should pay a visit to the Queensland Agricultural College at Gatton, to get a true idea of what is the proper housing for pigs. We do not say that they should go to the same expense in building the pens, but the *principle* can be adopted. We gave in the February number of the *Journal*, 1898, page 112, a description and figuration of very excellent pig-yards which we erected at a minimum cost of timber ready at hand on the farm. If farmers will study those yards, they cannot but be impressed with their value. Everything is arranged with a view to cleanliness and convenience. These are important factors as in the matter of thrift. Given clean, warm (or cool as the case may be), comfortable quarters, and the pig is a gentleman who more than pays the rent.

Now there is another matter which the pig-breeder for profit should not lose sight of. Pigs are subject to indigestion, fever, &c. When a human being suffers from indigestion he changes his diet. What is known as "heartburn" in the latter, is much the same complaint in the pig. The remedy for this is charcoal, or even decayed wood. The digestion being assisted, the food being assimilated, the health of the pig is maintained, and he puts on flesh rapidly, and so becomes a source of profit to his breeder.

Here is another hint. It does not pay to keep pigs too long. As soon as they have attained a weight suitable to the market—sell. To keep on feeding pigs, with the exception of the breeding sows, after they have attained the weight required for "baconers," is simply to throw away money. To sum up. Never keep anything but a good strain. House the animals properly, protecting them from sun and rain. Feed them judiciously with a variety of food, keeping at the same time to the staple food which builds up the body. Get them into condition as quickly as possible, and then sell.

The Orchard.

FRUIT CULTURE IN QUEENSLAND.

By ALBERT H. BENSON.

THE DESTRUCTION OF FRUIT PESTS.

As there is probably nothing that causes more loss and annoyance to fruit-growers throughout the colony than the ravages committed by the many insect and fungus pests attacking fruit and fruit trees, I purpose dealing with this very important question in the present number of this *Journal;* and I trust that the information given may be of benefit to many fruit-growers, as it is based on actual experience and is not mere theory. The illustrations accompanying the article are also original, and are reproduced from instantaneous photographs of the actual operations of spraying and cyaniding taken by Mr. F. C. Wills, the artist to this Department.

SPRAYING.

Shortly after my arrival in this colony, I wrote a brief bulletin on spraying; and, as a good deal of the matter contained therein is applicable to the present article, I purpose quoting largely from it. The question of the best methods of destroying fruit pests of various kinds is one that has occupied the attention of gardeners and orchardists for generations, but it is only within comparatively recent years that the various diseases have been made an especial study by scientific men in different parts of the world, especially in the United States of

Plate XCV.

Fig. 1.

Fig. 2.

KNAPSACK SPRAYING APPARATUS.

America. The result of the investigations of many scientists has been that, instead of attempting to treat fruit pests by rule of thumb, the life history of many pests has been worked out, their habits studied, and remedies discovered for treating them on scientific lines. The best, most effectual, and most economical method of applying the various remedies was also carefully gone into, with the result that it was proved that mixing the various remedies with water and distributing them over the tree and fruit, in the form of a very fine spray, gave the best results in a very large number of cases. This method of applying remedies is known as "spraying," and has necessitated the manufacture of special pumps fitted with special nozzles with which to apply the spray. There are many kinds of spray pumps and nozzles now manufactured, varying in size from the knapsack spray pump, which is carried on the back of the operator, to powerful force pumps capable of throwing as many as six sprays at once. Several kinds of spray pumps are now obtainable in this colony, most of which are suitable for the purpose for which they are required. In selecting a spray pump, pay attention to the following particulars:—

(1) Never buy too small a pump, as the more powerful the pump the better the work, and the less spraying material you require. If a large pump is too much for one grower, then let several small growers club together and get one good outfit amongst them; it will be much better to do this than for each grower to have an inferior outfit.

(2) See that the pump is easy to take to pieces for cleaning or packing, and that it is simply and strongly constructed.

(3) See that all the valves are of copper or brass, as bluestone is largely used in spraying, and it will corrode all the iron with which it comes in contact.

(4) See that you have a good supply of nozzles, for, though one nozzle may be perfect for one purpose, it may be useless for another. All nozzles should be interchangeable.

(5) Knapsack pumps are the best for vines, vegetables, or tobacco; but larger pumps attached to casks or other receptacles are better for orchard use.

When you have purchased a spraying outfit, see that you take care of it. Never put it away dirty, but always run a bucketful of clean hot water through it after using. Drain the hose dry, roll it up carefully, clean out all nozzles, and see that all taps work easily, oiling same if necessary. If you do this you will find that your pump will work when you want to use it, but if you do not do it the chances are that just when you want to use the pump that it is out of order and you lose the crop in consequence.

The illustrations herewith give a good idea of the operation of spraying, and of the method of carrying it out. Figs. 1 and 2, Plate XCV., show the method of using the knapsack pump—1st, for spraying vines, vegetables, &c., when a short brass pipe fitted with a Vermorel nozzle is used; and 2nd, for spraying fruit trees up to 12 or 14 feet high, when a bamboo extension 6 to 8 feet long, as shown, is attached to a short hose connected to the pump, the bamboo being fitted to take any nozzle, that shown in the illustration being a triple cyclone nozzle. This pump is an exceedingly handy one for the small fruit-grower who combines the growing of cucumbers, melons, tomatoes, &c., with fruit culture, as it is a good all-round machine, and is easily handled. In using most knapsack pumps, care must be taken not to use kerosene emulsion or kerosene in any form, as the valves are rubber, and are destroyed by kerosene or any other mineral oil. The particular kind of knapsack spray pump shown in the illustration is known as the "Figaro," and is one that has given us great satisfaction. Its price, as shown in Fig. 1, is £2 7s. 6d. The bamboo and triple cyclone nozzle shown in Fig. 2 are extra.

Plate XCVI. shows one of Gould's spray pumps fitted on to a cask fixed to a sled, the whole being drawn by a horse. As shown, the pump is fitted with two lines of hose, to which two bamboo extensions are attached. It is a powerful pump, capable of distributing a very fine spray with considerable force, is strongly built, and not likely to get out of order. It and the Climax spray pumps, made by the Nixon Spray Pump Company, are two of the best American spray pumps, and cost from £6 to £7 complete. There are also several colonial-made spray pumps that do good work; and of these, those made by Danks and Co., Knowles, and the Doncaster spray pump are about the best. The latter pump is fitted with a special attachment for the use of kerosene without emulsifying, which is said to give good results in Victoria, but has not been thoroughly tested in Queensland.

Of the various kinds of nozzles in use, I prefer the three following:—The *Vermorel* and the *Triple Cyclone* for trees, vegetables, and vines; and the Nixon for trees. The two first give a very fine and wide-spreading spray that can be directed either to the under or upper side of the branches and leaves; and the latter throws a direct spray with great force, so that it is best adapted for spraying the trunks and branches of the trees, and, if a coarse nozzle is used, quite a thick mixture, that will adhere to these parts like a paint, can be applied.

There are two seasons of spraying—winter and summer; the former is done, when the leaves are off deciduous trees, as soon as the trees have been pruned. It should be very thoroughly done, as it is the main spraying of the year, as owing to the dormant condition of the tree and the absence of leaves stronger remedies can be used and the tree can be more thoroughly sprayed. The best all-round winter remedy is the sulphur, lime, and salt wash; but kerosene emulsion, Bordeaux mixture, and resin and caustic soda wash can also be used. The winter spraying should always be done with a powerful pump, the material used being forced into every crack or crevice, and every part of the tree should be covered. There is no necessity, however, to drown the tree. Fine nozzles that throw upwards or downwards should be used, so as to get the material on both sides of the branches.

Summer spraying is always done with special mixtures, no all-round remedy such as the sulphur, lime, and salt wash being used. Much weaker mixtures are required, and much more care is necessary in their application, so as to prevent injury to the fruit or foliage. Never spray whilst a strong drying wind is blowing, or during a burning hot day, if you can help it; rather spray in the early morning or late in the afternoon. If, however, it is a case of emergency, such as an attack of caterpillars, leaf-eating beetles, or grass-hoppers, then you must spray away whether the weather is favourable or not, even if you do injure a few trees or vines, as it is better to injure a few than to lose the whole.

Sprays cannot be too fine, especially when you are using arsenical poisons or fungicides, and the more evenly they are distributed the better the work they do, and the less material is required. Always prepare your spraying material carefully according to the recipes given; see that it is properly mixed, is carefully strained, and that it is kept well stirred when in use. In the case of Paris green this last is of the greatest importance, as unless the mixture is kept well stirred it soon settles, and that in the bottom of the cask is much too strong, and will do more or less injury to the trees to which it is applied. When using strong kerosene emulsion or strong resin washes, see that the mixture does not run down the trunk and main branches in sufficient quantity to saturate the ground at the collar of the tree, as if this takes place the tree will be injured by the bark being destroyed. Tying a sack round the trunk of the tree close to the ground will prevent this.

A little extra care in attending to the details of preparing and applying the mixture, as well as to keeping the pump in good working order, saves a lot of time in the field and gives much better results.

Having now dealt with the application of remedies for the destruction of fruit pests by means of spraying, a few words on the fruit pests themselves and of the remedies for destroying them will not be out of place.

Plate XCVI.

SPRAYING PUMP ATTACHED TO A CASK ON A SLEDGE.

FRUIT PESTS.

The pests attacking fruit and fruit trees are principally of two kinds—first, those caused by insects; and secondly, those caused by microscopic fungi. There is another class of diseases, probably due to bacterial agency, but of this class very little is known, and no remedies other than keeping the trees in health by proper manuring, drainage, and cultivation can be suggested. Insect pests and fungus pests require, as a rule, different treatment, as remedies which are efficacious in the case of an insect might not be of any use whatever in the case of a fungus and *vice versâ;* hence it is of the greatest importance that fruit-growers should make themselves acquainted with the various pests attacking their fruit or trees, so they can at once tell the cause of the injury and know what remedy to apply. If at any time a grower has the slightest doubt as to whether a disease is caused by an insect or a fungus, then I strongly advise him to send specimens of the disease to the Department of Agriculture for identification, as this will prevent him from applying wrong remedies.

INSECT PESTS.

Insects damage fruit and fruit trees in various ways; consequently different classes of insects require different treatment.

1. *Insects Destroying Foliage, &c.*—A large number of insects—such as caterpillars of all kinds, leaf-eating beetles, crickets, grasshoppers, cut-worms, &c.—do considerable damage by eating the leaves of the tree, skin of the fruit, or bark of small branches. They actually devour their food, not merely suck it; so that if you poison the food on which they are living they will eat the poison and die. The best remedy, therefore, for all this class of destructive insects is to spray the trees or plants on which they are feeding with arsenical poisons, such as Paris green, London purple, or arsenate of lead. These poisons are either used alone or they may be used in conjunction with lime or with Bordeaux mixture; the latter being the better plan when the trees require spraying for both insects and fungi, as one spraying answers for both.

2. *Insects Living by Suction.*—These insects do a very large amount of damage, and unless they are taken in hand in time are often somewhat difficult to keep in check. All aphides, scale insects, and plant-sucking bugs, such as the bronzy and green orange bugs, are included in this section; and the remedies used are those that destroy the insects by actually touching them, or by so covering them over that they cannot breathe, or by suffocating them by means of poisonous gases. This last method is known as the gas treatment, and is fully described later on. Arsenical poisons are of very little use for these insects, as they only suck the skin or leaves, but do not eat them. The best sprays to use for these insects are resin washes: either a simple resin soap wash in the case of aphides, or a wash consisting of oil, resin, and caustic soda or caustic potash for destroying scale insects, kerosene emulsion, either used by itself or in conjunction with resin or a starch solution, and extracts of tobacco and nicotine used in conjunction with whale-oil soap.

3. *Insects Boring into the Fruit.*—This class contains some of the worst insect pests, such as the Codlin Moth, Fruit Fly, Yellow Peach Moth, fruit-boring weevils; and these insects have all to be treated more or less differently. However, there is one general remedy for all this class of pests, and that is the careful gathering daily of all fallen and wormy fruit, *especially early in the season;* such fruit to be boiled and fed to pigs. In addition to this, the other remedies that I recommend are as follow:—For the Codlin Moth: Spraying with Paris green, 1 lb. to 160 gallons of water, just as the blossoms fall, repeating the spraying in ten days' time; gathering and destruction of all infested fruit; bandaging the trees as soon as the first crop of larvæ leave the fruit, the bandages to be removed and all larvæ destroyed at least once a week.

The best way to destroy the larvæ is to dip the bandages into boiling water; don't crush the larvæ on the bandages, or the dead insects will attract

ants and prevent any other larvæ from harbouring in them. Before placing the bandages on the trees, all loose bark should be carefully scraped off, as the object of placing the bandage round the tree is to provide a convenient shelter for the larvæ. If there is any natural shelter on the tree, then they will hide and pupate there instead of going under the bandages, thus rendering the bandages of little value.

The best remedy for the Fruit Fly is to destroy infested fruit, and thus prevent the larvæ from hatching out. The use of trap trees, and the destruction of all infested fruit on such trees, is also strongly recommended. A full report on the fruit-fly experiments appears in another part of this *Journal.*

For the Yellow Peach Moth, Paris green applied as soon as the fruit sets would destroy a large number of the insects; and again it is advisable to thin the fruits, leaving only single specimens, as this pest is always worst in cases where the fruit is thickly clustered together. The Fruit Weevil: This insect seldom attacks the fruit unless it has been injured by some other pest, sound fruit being seldom attacked.

4. *Insects Boring into the Roots, Stem, or Branches.*—These are true boring insects, and are usually the larvæ of beetles of various kinds. Some of these beetles are leaf-eaters, and can be destroyed by spraying with Paris green; others, again, can be destroyed by placing a cloth under the trees and then giving the branches a few sharp raps, when all the insects will fall to the ground, and can be swept off the sheet and destroyed. When the insects are in the larval or borer stage, if they are of large size they can often be killed by inserting a fine pliable wire into their burrows, or by injecting a small quantity of kerosene or turpentine into their burrows, and plugging up the outlet with a piece of soft wood or clay. In any case when borers are at all troublesome, the mature insects (beetles) should be destroyed whenever and wherever they are found.

FUNGUS PESTS.

The principal fungus pests are caused by very lowly organised microscopic fungi which attack either the leaves, bark, or fruit, sometimes the whole tree. These diseases attack the tree at any time, but the greatest amount of damage is done either when the fruit is setting or when it is ripening. Most of these microscopic fungi are purely surface feeders, and only attack the skin of the fruit, leaves, or bark; and for all such there is one sure remedy, provided that it is applied in time—namely, Bordeaux mixture. All fungus diseases are much easier prevented than cured; hence where they are present it pays to spray the whole of the trees in an orchard, even though many of them have shown no previous sign of disease. Bordeaux mixture destroys the spores (seeds) of these injurious fungi, and the time that the spores are most easily destroyed is just as they are starting into growth. Those fungi that attack the fruit when it is setting—such as the Shot-hole Fungus of the apricot, peach, and plum; the Pear Scab, or Windsor Pear Blight of the pear; the Apple Scab, or Tasmanian Black Spot of the apple; Anthracnose. or Black Spot of the grape—should be sprayed for: First, just when the buds are swelling in spring, and again when the fruit is setting, subsequent sprayings being given as required. The fungi attacking ripening fruit—such as the Bitter Rot of the apple, the Peach Freckle, and the Black Brand (Black Spot) of the orange—can be prevented by spraying the fruit just as it commences to show the first signs of ripening; but this is often unnecessary where the trees have been well sprayed in the early spring.

REMEDIES.

A.

Bordeaux Mixture—A Fungicide.

Winter Strength.—6 lb. bluestone, 4 lb. of unslacked lime, 22 gallons of water.

Summer Strength.—6 lb. bluestone, 4 lb. of unslacked lime, 40 gallons of water.

Prepare as follows (for the 40 gallons solution, the 22 gallons solution in proportion):—

(1) Dissolve 6 lb. of bluestone in 20 gallons of cold water in one cask, by placing it in a bag and suspending it in the water.

(2) Slack 4 lb. of unslacked lime in another cask slowly by first pouring about 3 pints of water over it. This will reduce the lime to a thick cream free from lumps. Water should now be added, stirring well till there is 20 gallons of milk of lime in the cask.

(3) Stir the milk of lime up well, strain it and pour the whole of the 20 gallons of milk of lime and the 20 gallons of bluestone water together slowly into a third cask; stir well for 3 minutes, and if properly made the mixture is fit for use.

The mixture is much better if made in this manner than when a strong solution of bluestone and lime are first mixed together, and water to make up the required quantity is afterwards added.

In order to see if the mixture is properly made, plunge the blade of a knife into it for a minute. If the knife is untarnished the mixture is all right; but if the knife is stained a coppery colour, then more milk of lime must be added.

The mixture should always be neutral, as if there is an excess of bluestone it is apt to injure the foliage. Use water that is free from iron, and do not make the mixture in iron, zinc, or tin vessels of any kind—wood is the best.

If desirable, a stock solution of bluestone may be kept on hand for use as required. Such a solution may be made by dissolving 100 lb. of bluestone in 50 gallons of water. Place the 100 lb. of bluestone in a bag and suspend it in the cask of water, and in the course of a couple of days the whole of the bluestone will be dissolved, and each gallon of the solution will contain 2 lb. of bluestone.

To make the 40-gallon solution you therefore take 3 gallons of the stock solution of bluestone and add 17 gallons of water to it, to make up the 20 gallons of bluestone solution for mixing with the 20 gallons of milk of lime as previously described. A stock solution of milk of lime can also be made, but it is better to make it as required.

Bordeaux mixture is a fungicide, and it is of little value as an insecticide. It, however, combines well with arsenical poisons, in which state it is a very good combined spray.

B.

Paris Green.

This is the best remedy for all insects that actually devour their food. It is a powerful arsenical poison, and a good sample should contain at least 50 per cent. of arsenious acid. It is generally used by itself, but if desired it can be used with lime, in the proportion of 1 lb. of Paris green to 4 lb. or more of lime. Mixing it with lime tends to make it less dangerous to handle, and will not interfere in any way with its action. It can also be used in conjunction with Bordeaux mixture. The best way to mix Paris green with water is to place it in a cup or billy with a little cold water and thoroughly moisten every particle, the same way as mustard is mixed up for table use; then add more water gradually, stirring well whilst doing so, till it is thoroughly mixed; then add the requisite quantity of water. Paris green is used at a strength not exceeding 1 lb. to 160 gallons of water. It must always be kept well stirred whilst in use. It must not be sprayed on during rain, sunshine, or heavy drying winds. It should not be applied to either fruit or vegetables within a month of the time of gathering. It should be handled with care, and kept out of the way of children. It should always be applied as a very fine spray, and persons spraying should take care not to inhale too much of the spray.

When used on cabbages, it is a good plan to add a little treacle to the water in which the Paris green is suspended, as this will make the mixture adhere better.

C.

KEROSENE EMULSION.

Take 2 gallons of best kerosene, 1 gallon of boiling water, and 8 oz. of soft soap. Dissolve the soap in the boiling water; when dissolved add the kerosene and churn the mixture with a spray pump or syringe for fully 10 minutes, so as to get the oil and water thoroughly emulsified, when the mixture becomes stable and the oil will not separate from the water, even when kept for a considerable time. If the oil is not thoroughly emulsified and there is free oil present, it is apt to injure the foliage when applied, and if free oil gets on to the roots of the tree in any quantity it will probably kill the tree; therefore it is always best to be on the safe side, and be sure that you churn the mixture till it is properly emulsified. The strength at which kerosene emulsion is applied varies with the trees to which it has to be applied, and with the insects that are to be destroyed. For scale insects on citrus trees, olives, and hard-wooded trees generally, 1 gallon of emulsion added to 7 gallons of water will not injure the tree, except perhaps a few very tender shoots; but when used on peaches, Japanese plums (not persimmons), it must be used much weaker; in fact, I do not recommend it for these trees when they are in leaf, though it is valuable as a winter wash for destroying scale insects. Where peach-trees are attacked with Black Aphis, then the resin and soda wash described later is the better remedy to use. Kerosene emulsion is one of the best remedies for all insects that live by suction, especially scale insects of all kinds. It can be used by itself, or if the trees to be sprayed are covered with fumagine—the sooty fungus which always accompanies certain scale and other insects—it can be used in conjunction with as thick a solution of starch as can be got through the nozzle of the pump. The starch solution is made by making a paste of flour the same as that used by bill-stickers, and straining it carefully from all lumps. The combined mixture forms a thin coating over the scales, leaves, branches, fruit, &c., which peels off when dry, taking the dead scales and fumagine with it, and leaving the trees clean.

D.

RESIN AND SODA WASH.

A cheap, weak wash for destroying Aphides, Red Spider, Thrips, and young scales before they are protected by their hard covering, when this remedy is not sufficiently strong to kill them. Take 4 lb. of resin and 3 lb. of washing soda and boil in 2 gallons of water. Add boiling water slowly to make up 5 gallons, taking care that the mixture is boiling all the time. The mixture should be boiled till the resin is thoroughly dissolved, when water to make 40 gallons of wash is added. This wash works easier in the pump, and is more efficacious when applied at a temperature of about 130 degrees. It is a very cheap and efficacious wash, and will not injure the fruit or foliage in the slightest, and it has the advantage of destroying large numbers of aphis-eggs as well as the perfect insects, as it covers them with a thin glaze or varnish of resin which prevents their hatching. It should be applied at any time that aphis are found, except during a very hot or windy day. If it is found that adding water to make 40 gallons makes the wash too weak, then only add enough water to make 30, or even 20, gallons of wash. The sticky nature of this wash clogs the pump if it is not kept clean, and the best way to clean it is to rinse it out with boiling water and soda after using and before putting the pump away.

E.

RESIN WASH FOR SCALE INSECTS.

The following wash is much stronger than the preceding one, and can be used in the place of kerosene emulsion for spraying scale insects. In the case of the Mussel Glover and White Scales of citrus trees, and in that of the Mussel Scale of the apple, it is a better remedy than the emulsion. It is prepared as follows:—

Take 20 lb. of resin, 6 lb. of caustic soda (70 per cent.), 3 pints of fish oil, water to make 80 gallons; place the resin, caustic soda, and fish oil in a large boiler with 20 gallons of water, and boil for 3 hours; then add hot water slowly, and stir well till there are at least 40 gallons of hot solution; then add cold water to make up the total to 80 gallons. Never add cold water when cooking, or the resin will be precipitated, and it will be difficult to get it in solution. The above is the strength to use for citrus trees; a winter wash for deciduous trees may be used one-half stronger, the total amount being made up to 54 gallons instead of 80 gallons.

F.

Sulphur, Lime, and Salt Wash.

This is an all-round winter wash for all kinds of deciduous fruit trees, but is not used for citrus trees. It is both a fungicide and insecticide, being one of the best remedies for the San José Scale and the Mussel Scale of the apple. It is made as follows:—

Take 40 lb. of unslacked lime, 20 lb. of sulphur, 15 lb. of salt, and 50 gallons of water.

To mix, take 10 lb. of lime, 20 lb. of sulphur, and 20 gallons of water; boil for not less than one hour and a-half, or until the sulphur is thoroughly dissolved, in a strong iron not a thin copper boiler; when the mixture will be of a light amber colour. Slack 30 lb. of lime in a barrel with hot water, and when thoroughly slacked, but still boiling, add the 15 lb. salt; when this is dissolved the whole should be added to the lime and sulphur in the boiler, and the whole boiled for half-an-hour longer, when water, to make the whole up to 50 gallons, should be added. Strain through a wire-sieve, and keep well stirred whilst in use.

As this mixture is very hard on the hands, use gloves when spraying, and have good bamboo extensions fitted to the hose attached to the spray-pump. It is also hard on the pump and nozzles, so see that the pump is kept clean, and is never put away without being rinsed out with very hot water.

G.

Whale-oil Soap and Black Leaf Tobacco Extract.

Dissolve $\frac{1}{4}$ lb. of whale-oil soap in 1 gallon of water, and add 1 to 2 fluid oz. of black leaf tobacco extract. A splendid wash for delicate plants, very efficacious in the case of Aphis and Thrips.

H.

Whale-oil Soap and Nicotine.

Dissolve $\frac{1}{4}$ lb. of whale-oil soap in 1 gallon of water, and add $\frac{1}{2}$ fluid oz. of nicotine. This wash is used for the same purposes as the preceding one.

I.

Sulphur.

This is one of the best remedies for the Rust Mite or Maori of the orange, and for Red Spider or other spinning mites that attack almonds, apples, plums, &c. It is also the best remedy for Oidium of the grape, pumpkin, melon, &c. The finer the sulphur the better, as the finer it is the more sulphur vapour it gives off, as it is not the sulphur but the sulphur vapour which is of value. Many good authorities consider that the best time to sulphur is from 10 a.m. to 4 p.m., instead of the early morning, the sulphur being applied by means of a bellows, or a specially constructed knapsack sulphurer. For Maori the sulphur should be applied when the oranges are about the size of marbles, as it is at this stage that the insects do their damage, though the results are not shown till the fruit ripens.

K.

A Paint for the Trunks and Main Branches.

Boil 2 lb. of sulphur and 1 lb. stone lime in 2 gallons of water for an hour and a-half. Then add 3 lb. more stone lime and boil half-an-hour. Make up with boiling water to 2 gallons, and add enough fine flour or fine clay to the mixture to make it of the consistency of thin paint.

The following tabulated list gives the principal varieties of fruits grown in the colony, together with the chief diseases attacking each particular variety, and with suggested remedies for the same. The Black Smut, which covers many fruits and fruit trees, is prevented by destroying the scale insects, aphides, and other sucking insects that exude honeydew, as the Smut lives on the excretions of these insects, and is not a disease of the tree:—

Variety of Fruit.	Disease.	Remedy Suggested.
Almond ..	San José Scale	F in winter, K
	Red Spider and Mites ..	F in winter, D in spring. I when insects hatching out
	Shot Hole Fungus	A
	All insects eating foliage ...	B
Apple	Codlin Moth	B. Bandaging, destroying infested fruit
	Fruit Fly	Gather and destroy all infested fruit
	San José Scale	F, K
	Mussel Scale	F, K
	Parlatoria Scale	F, K
	Greedy Scale...	F, K
	All insects eating foliage ...	B
	Woolly Aphis	D, G, H. Resistant stocks
	Powdery Mildew	A
	Black Spot	A
	Bitter Rot	A
	Bitter Rit	A
	Canker...	A. Lime wash
Apricot... ...	Shot Hole Fungus	A
	Gum	Cut away diseased part till clean bark is found, and paint wound with K
	Fruit Fly	Gather and destroy all infested fruit
	All insects eating foliage ...	B
Banana ...	Fruit Fly	Gather and destroy all infested fruit
	Banana Disease	Thorough drainage and systematic manuring, especially with green manures
	Nematodes on roots... ...	Dig up and burn
	Borers in stems and roots ...	Dig up and burn
	Gum in fruit	Try making a cut lengthwise in stalk of bunch 1 month before cutting
Cherry	Pear Slug	B
	Shot Hole Fungus	A
	Gum	The use of suitable stocks. Drainage. Cut out clean and paint wound with K
	Fruit Fly	Gather and destroy all infested fruits
	All insects eating foliage ...	B
Citrus Fruits ..	Scale insects of various kinds	C and E. Gas treatment and K
	All insects eating foliage ...	B
	Aphis	D, G, H
	All sucking bugs	C when young, hand gathering, driving to centre of tree and destroying
	Borers	B, destroying mature insects. Injecting kerosene into and plugging up hole
	Sucking Moths	Attract with poisoned ripe cavendish bananas
	Fruit Fly	Gather and destroy all infested fruit
	Peach Moth	B. Gather and destroy infested fruit
	Maori	I
	Melanosis	A
	Black Brand	A
	White Fungus, and all moss and lichen growths	A. Lime wash, K
	Gum, Bark Rot, Root Rot	Cut out clean and cover wound with K. Good drainage
Custard Apple...	Scale insects of various kinds	C and E
	Peach Moth	B. Gather and destroy infested fruit

Variety of Fruit.	Disease.	Remedy Suggested.
Fig	Scale Insects of various kinds	F, K, C
	Fig Beetle and all other insects eating foliage	B
Guava	Scale Insects of various kinds	Cut out and burn all worthless trees, and look well after any that are kept.
	Fruit Fly	Gather and destroy all fly-infested fruit
Mango	Scale Insects of various kinds	C, E. Gas treatment
	Fruit Fly	Gather and destroy all infested fruit
	Leaf Burn	A in early spring
	Beetles on flowers	B, G, H. Dense smoke
Olives	Scale Insects	C
	Thrips	D, G, H
Peach and Nectarine	San José and other Scale Insects	F and K
	Peach Moth	B. Thin out fruit, gather and destroy infested fruit
	Fruit Fly	Gather and destroy infested fruit
	Peach Aphis	D, G, H
	Curl Leaf	A early in spring
	Peach Freckle	A
	Mites and Red Spider ...	I
	Gum	Cut out clean and cover wound with K
	Canker, moss, lichens ...	A. Lime wash
Pear	San José and other Scale Insects	F and K
	Pear Slug	B
	Pear Mite	D
	Fruit Fly	Gather and destroy all infested fruit
	Codlin Moth	B, bandaging. Destroy all infested fruit
	Black Spot	A
	Canker, moss, lichens ...	A, L. Lime wash
	All insects eating foliage ...	B
Persimmon ...	Scale Insects of kinds ...	F, C, K
	Canker, moss, and lichen ...	A. Lime wash
	Fruit Fly	Gather and destroy all infested fruit
Pineapple ...	Pineapple disease	Only plant on well-drained land
	Cripples	Never plant a sucker from a plant that has produced a cripple
Plum	San José and other Scales	F and K
	Red Spider and Mites ...	F, I
	Fruit Fly	Gather and destroy all infested fruit
	All insects eating foliage ...	B
	Shot Hole Fungus	A
	Gum	Cut out clean and cover wound with K
	Canker, moss, and lichen ...	A. Lime wash
Quince	Fruit Fly and Codlin Moth	Gather and destroy all infested fruit
	Moss, lichens, and canker ...	A. Lime wash
	Scale Insects	F
Strawberry ...	Leaf Blight	Cut off and burn all infested leaves. Spray with A
Other fruit trees	Scale Insects	C, D, F, K, or gas treatment
	All leaf-eating insects ...	B
	Moss, lichens, canker ...	A, L. Lime wash
	Fungus diseases	A

GAS TREATMENT FOR SCALE INSECTS.

Although of comparatively recent introduction (1886), this method of destroying scale insects, particularly those attacking citrus trees, is now considered to be the most effectual remedy known. In the extensive orange orchards of California it has practically taken the place of spraying for the

destruction of the Red Scale of the orange (*Aspidiotus Aurantii*), the Purple or Mussel Scale (*Mytilaspis citricola* or *M. fulva*), and all other armoured scales. In Cape Colony it is now being largely used for the destruction of the Red Scale, and Mr. Charles P. Lounsbury, the Government Entomologist, states that it is the cheapest and most effectual remedy for this particular insect. The use of hydrocyanic acid in these colonies is even of more recent introduction, as up till some fifteen months ago, when this Department commenced experimenting, I am only aware of its having been tried by three persons—viz., Mr. G. Quinn, Inspector of Fruit, South Australia, and Messrs. A. Philp, junr., Gatton, and O'Brien, Sunnybank, in this colony.

Messrs. Philp and O'Brien only carried out experiments in a small way, though as far back as 21st December, 1896, Mr. Philp wrote to this Department that the scale (White), for which he was treating his orange-trees, "seems to be perfectly dry and without life"; and also "orange bugs of various kinds were found dead under the tree after the tarpaulin was removed."

Mr. Quinn gave his experience of this method of treatment at the Intercolonial Conference of Fruitgrowers held in Brisbane during June, 1897, and stated: "During the past year he had made several experiments for the treatment of the Red Scale, and at the present time (June, 1897), for one living scale to be found on the trees treated with cyanide, thirty will be found on those treated with the resin wash and fifty on those treated with kerosene emulsion. He had tried the cyanide process on other trees in other orchards, and in one case, as a result, not a single living insect could be found, although neighbouring trees were affected. The fruit which had been produced this season from 'cyanided' trees was particularly clean, and the trees themselves were looking clean and healthy."

The experiments conducted by this Department have been varied and extensive, and have been carried out on various kinds of fruit and ornamental trees that have been affected with many varieties of scale insects, including the following:—Red Scale of citrus fruits, Circular Black Scale, Mussel Scale, White Scale, Glover Scale, Greedy Scale, various species of Lecaniums, San José Scale, and Pink Wax Scale; and in every case, the insects treated have been destroyed. Considerable difficulty was encountered in several ways during the course of the experiments, the chief of which was to obtain suitable material for the sheets and bell tents, as we found that the material and dressing recommended by the Californian authorities was unreliable and unsuitable, and several other materials tried were not a success. Oiling the sheets and tents is a mistake, as, though it renders them absolutely gas-tight, it, at the same time, injures the texture of the fabric, rendering it rotten and easily torn. Acting on the advice of Mr. Lounsbury, who has had a similar experience, we are using the best Canadian duck, without oiling, and find that it stands much more work, and is sufficiently gas-tight for all practical purposes. In order to preserve the material, we have tanned the sheets and tents made of Canadian duck with a strong extract of ironbark and wattle-bark, but have used no material to render it gas-tight.

Considerable difficulty has also been met with in determining exactly how much cyanide to use for particular scales and for particular trees, so that the scales should be killed and the trees uninjured, and this has only been learnt by actual experience. We have, however, overcome this difficulty, and, at the end of this article, I have given a long list of the approximate quantities of the different materials required for different sizes of trees, taking as a basis 1 oz. of cyanide of potassium to every 300 cubic feet of space enclosed by the tent or sheet. The method of applying the gas is to envelop the tree to be treated with a gas-tight covering. These coverings are made of two shapes, viz.:—Bell tents and octagonal sheets. The former can be made large enough to cover trees up to 10 feet in diameter and 12 feet high, but for trees above this size sheets are preferable, as bell tents would be too heavy and unworkable.

Plate XCVII.

Fig. 1.

Fig. 2.

Fig. 1.—TENT IN POSITION TO BE THROWN OVER A TREE.
Fig. 2.—TENTS READY FOR CYANIDING OPERATIONS.

Plate XCVIII.

SHEET RAISED READY TO BE THROWN OVER A TREE.

[illegible]

Plate XCIX.

Fig. 1.

Fig. 2.

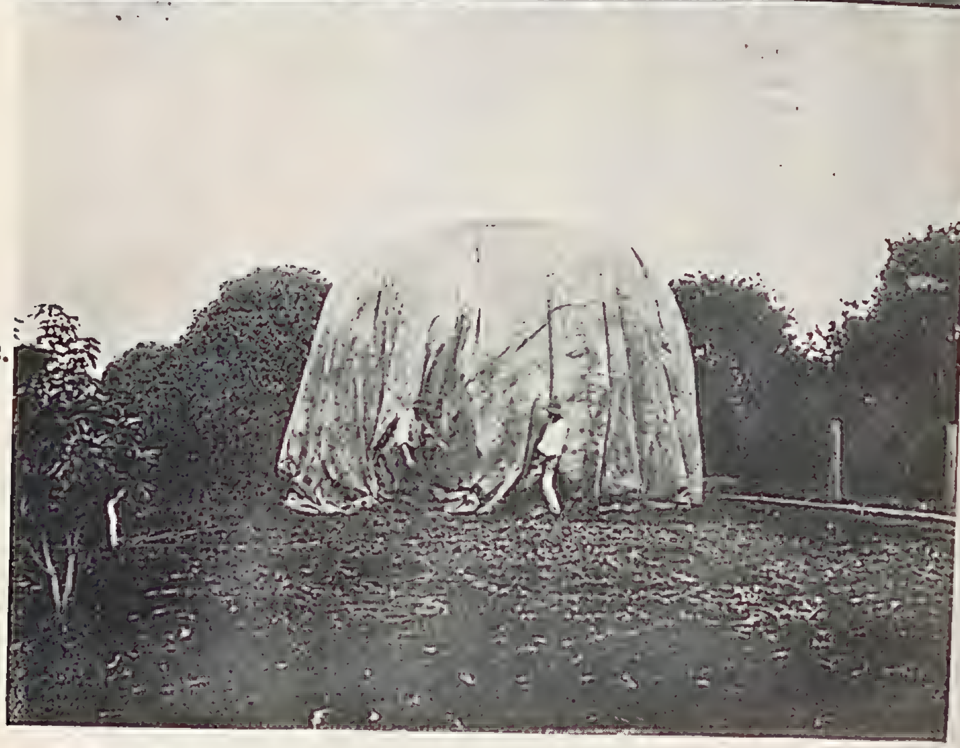


Fig. 1.—SHEET FALLING OVER A TREE.
Fig. 2.—A TREE COVERED AND READY FOR CYANIDING.

The bell tents at present used by this Department are of two sizes—one made of 7 widths of 36-inch duck, 9 feet long; and the other of 9 widths of 36-inch duck, 13 feet long. The former will treat trees under 7 feet high and 6 feet in diameter; and the latter, trees under 10 feet high and $8\frac{1}{2}$ feet in diameter. A size larger and a size smaller would also be convenient to work, and would be a valuable addition to our present outfit, as the smaller size that we have is too big for small trees, and the larger size is too small for many trees that we could treat by means of a larger bell tent. Bell tents are easily and rapidly handled, the method of placing them over the tree being shown in the accompanying illustrations. In Fig. 1, Plate XCVII., the tent is in position ready to be lifted over the tree, and in Fig 2 the tents are shown ready to be charged.

The mouth of the bell tent is kept open by means of a ring of $\frac{5}{8}$-inch galvanised iron piping, which is attached to the tent by means of rings or strings as may be desired. When placed over the tree, a little earth is put round the ring and bottom of tent in order to prevent the escape of the gas. The apex of the text is made of double strength, and has a rope ring sown on to it, through which a forked stick is placed when placing the tent on, or taking it off, when the tree has been treated. The use of the ring and forked stick is shown on Fig. 1.

The sheets are octagonal in shape, and those in use by the Department vary from 30 feet to 50 feet in diameter. With the exception of one oiled sheet, the material used is the best Canadian duck, 36 inches wide, well sewn together with best linen thread, and all edges bound. The cost of the material used is $11\frac{1}{2}$d. per square yard, and the price paid for making has been $1\frac{3}{4}$d. per square yard, and this latter charge can probably be reduced.

The method of using the sheets is well illustrated by Plates XCVIII. and XCIX. Plate XCVIII. shows the method of raising the sheet so that it is ready to be thrown over the tree. Fig. 1 of Plate XCIX. shows the sheet in the act of falling over the tree, and Fig. 2 of same plate the tree covered ready for treatment.

The following tackle is required for raising the sheets:—Two uprights for placing, one on each side of the tree, made as follows:—The poles are 30 feet in length and can be made of any suitable material, a piece of straight-grained Oregon pine, 4 inches by 2 inches, free from knots, being probably the best timber to use. The poles are attached to bottom plates 6 feet in length, 6 inches by 2 inches, and stayed to same by 3-inch by 2-inch braces 5 feet long, which are firmly bolted to the base and to the pole. Instead of using pine, the Department use strong bamboos, which are attached to a base and stayed to it by $\frac{5}{8}$-inch round iron attached to a clamp on pole. The bamboos are strong, light to handle, and answer well if straightened when first cut. In selecting bamboo poles, care must be taken to see that they are mature, as, if not, they are not strong enough to stand the strain of raising the larger sheets. A guy rope of 2 inches circumference, about 50 feet long, is attached to the top of each upright, and the sheet is raised by means of a fixed pulley attached to the top of the upright, and by a movable pulley which is attached to the sheet; the two pulleys being connected by 100 feet of rope of $1\frac{1}{2}$-inch circumference. The movable block is attached to the sheet by means of a movable tie which is placed on the sheet at 6 or 8 feet from its edge, this being found a better plan than attaching the pulley to fixed rings on the edge of sheet, as the latter is easier raised and, when thrown over the tree, the lap falls into its right position.

To raise the sheet, which should be laid out at the back of the tree ready for raising, the uprights are raised, each by two men—one at the base of the pole hauling on the block rope, and the other at the pole itself. When upright, the man who has raised the pole takes the guy rope and holds the uprights in position—viz., slightly leaning from him. The two men at the block ropes then raise the sheet, and, when high enough, the other two men at the guy ropes pull steadily, and thus draw the sheet slowly over the tree, the uprights falling with the sheet. A little earth is now placed round the edges of the sheet, and the tree is ready for treatment.

The charging of the tents or generation of the gas is done as follows:—Having calculated the cubic contents of the tree, say 1,200 cubic feet, you allow 1 oz. of cyanide of potassium, 1 fl. oz. of sulphuric acid, and 3 fl. oz. of water to every 300 cubic feet of space; that is to say, for 1,200 cubic feet, you will require 4 oz. of cyanide of potassium, 4 fl. oz. of sulphuric acid, and 12 fl. oz. of water. You first place the 12 fl. oz. of water in an earthenware dish (a pudding-basin answers very well); then add the sulphuric acid to the water, taking care to pour it on slowly and not to splash, as the acid will burn holes in the clothes or injure the face, arms, or hands of the operator if not carefully used. The basin containing the acid and water is next placed under the sheet or tent, as far from the canvas as possible. The cyanide is then added, and a small piece of sacking is placed over the basin to prevent spurting. The operator takes especial care not to breathe whilst under the tent, after having added the cyanide to the acid and water, and gets out as quickly as possible, the bottom of the sheet or tent being made air-tight as soon as he has got out. The gas is generated very rapidly, and is a deadly poison, all scale or other insects breathing it being killed. The trees remain covered for 45 minutes, when the sheets or tents are removed to other trees. On a quiet night, especially when using large doses, it is advisable to take care when raising the sheets and tents to let the gas diffuse for a short time before going too near the trees, as although there is comparatively little danger in breathing the gas when well mixed with air, yet if too much is inhaled it is apt to cause a severe headache.

Great care has to be taken to prevent the acid from spurting or splashing on to the sheets or tents, as it destroys the material at once. All holes have to be mended, and for this purpose we have found that a rubber cement made by Mr. Cox, of Albert street, Brisbane, answers admirably. A small piece of duck is placed over the hole, and is firmly and quickly attached to the sheet by means of the cement. Care is also required not to pack the sheets away when damp, and to keep all poles, blocks, and tackle in good order. The cyanide of potassium, being a deadly poison, should always be kept under lock and key, and the sulphuric acid should always be handled with great care. When handling the cyanide, keep the finger-nails cut short so as to prevent the poison from accumulating beneath them, and wash the hands carefully before eating, as the poison is so deadly (under 3 grains being a fatal dose) that every possible precaution should be taken to prevent even the smallest particle getting on to the food.

Demonstrations of this method of treatment have already been given to the fruitgrowers of Mount Cotton, Zillmere, Bald Hills, and North Pine; and further demonstrations will be given in the Maryborough district within the next few days. In carrying out the experiment work, I have been ably seconded by Messrs. Voller and Henderson, and the following table is the work of the latter officer.

As previously stated, this table is only approximate, and the quantities are based on the assumption that 1 oz. of 98 per cent. cyanide of potassium, 1 fluid oz. of 98 per cent. commercial sulphuric acid, and 3 fluid oz. of water are required for every 300 cubic feet of space enclosed. This proportion is the same as that used by the Cape Colony authorities, with the exception that we use one-half more water, as we have found the extra water to be an advantage. Used at this strength, we have not found the gas to injure the trees in the slightest, and in the case of trees badly infested with Pink Wax and Red Orange Scale, we have used the gas one-half stronger—viz., 1 oz. of cyanide, &c., to 200 cubic feet of space; and even at this strength we have only found the younger shoots of oranges, lemons, and mandarins slightly burnt. Many varieties of mangoes stand an even greater strength during the winter months, and in the case of badly infested trees especially, if they are not making growth, I shall use the greater strength so as to be certain of

killing the eggs as well as the larvae and mature scales. These remarks apply particularly to the coast districts in which we have had experience, as it is possible that the quantities will have to be slightly modified to meet the requirements of the Downs and of the drier parts of the colony.

Diameter.	Height	Capacity.	Cyanide.	S. Acid.	Water.
Feet.	Feet.		Dwt.	Oz.	Oz.
4	4	42	3	¼	1
4	5	55	4	¼	1
4	6	67	5	¼	1
5	5	82	6	½	1½
5	6	100	7	½	1½
5	7	120	8	½	1½
6	6	140	10	½	1½
6	7	179	12	¾	2
6	8	200	14	¾	2
7	7	225	16	1	3
7	8	260	18	1	3
			Oz.		
7	9	300	1	1	3
8	8	340	1¼	1¼	4
			Oz. dwt.		
8	9	390	1 7	1½	4½
			Oz.		
8	10	440	1½	1½	4½
			Oz. dwt		
9	8	410	1 8	1½	4½
			Oz.		
9	9	480	1¾	2	6
9	10	540	2	2	6
9	11	600	2	2	6
10	8	500	1¾	1¾	6
10	9	570	2	2	6
10	10	650	2¼	2¼	7
10	11	730	2½	2½	8
10	12	810	2¾	3	9
11	8	586	2	2	6
11	9	680	2¼	2¼	7
11	10	770	2½	2½	8
11	11	870	3	3	9
11	12	960	3¼	3¼	10
11	13	1,060	3½	3½	11
11	14	1,160	4	4	12
12	8	678	2¼	2¼	7
12	9	790	2¾	3	9
12	10	900	3	3	9
12	11	1,020	3½	3½	11
12	12	1,130	3¾	3¾	12
12	13	1,240	4¼	4¼	13
12	14	1,357	4½	4½	14
12	15	1,470	5	5	15
13	8	770	2½	2½	8
13	9	850	3	3	9
13	10	940	3¼	3¼	10
13	11	1,070	3½	3½	11
13	12	1,200	4	4	12
13	13	1,340	4½	4½	14
13	14	1,470	5	5	15
13	15	1,600	5½	5½	17
14	8	870	3	3	9
14	9	1,030	3½	3½	11
14	10	1,180	4	4	12
14	11	1,330	4½	4½	14
14	12	1,490	5	5	15
14	13	1,640	5½	5½	17
14	14	1,790	6	6	18
14	15	1,950	6½	6½	20
14	16	2,100	7	7	21
15	8	970	3¼	3¼	10
15	9	1,150	4	4	12
15	10	1,330	4½	4½	14
15	11	1,500	5	5	15
15	12	1,680	5½	5½	17
15	13	1,850	6¼	6¼	19
15	14	2,030	7	7	21

Diameter.	Height.	Capacity.	Cyanide.	S. Acid.	Water.
Feet.	Feet.		Oz.	Oz.	Oz.
15	15	2,210	7½	7½	23
15	16	2,380	8	8	24
15	17	2,560	8½	8½	26
15	18	2,740	9¼	9¼	28
15	19	2,910	9¾	9¾	30
15	20	3,090	10½	10½	31
16	10	1,470	5	5	15
16	11	1,670	5½	5½	17
16	12	1,880	6¼	6¼	19
16	13	2,080	7	7	21
16	14	2,280	7¾	7¾	23
16	15	2,480	8¼	8¼	25
16	16	2,680	9	9	27
16	17	2,880	9¾	9¾	29
16	18	3,080	10¼	10¼	31
16	19	3,280	11	11	33
16	20	3,480	11¾	11¾	35
16	21	3,680	12¼	12¼	37
16	22	3,890	13	13	39
17	12	2,030	6¾	6¾	20
17	13	2,257	7½	7½	23
17	14	2,480	8¼	8¼	25
17	15	2,710	9	9	27
17	16	2,940	9¾	9¾	30
17	17	3,165	10½	10½	32
17	18	3,390	11½	11½	35
17	19	3,620	12	12	36
17	20	3,850	13	12	39
17	21	4,070	13½	13½	41
17	22	4,300	14½	14½	44
18	12	2,300	7¾	7¾	24
18	13	2,540	8½	8½	26
18	14	2,800	9½	9½	29
18	15	3,050	10¼	10¼	31
18	16	3,300	11	11	33
18	17	3,560	12	12	36
18	18	3,810	12¾	12¼	39
18	19	4,070	13½	13¾	41
18	20	4,320	14½	14½	44
18	21	4,580	15¼	15¼	47
18	22	4,830	16	16	48
18	23	5,080	17	17	51
18	24	5,340	18	18	54
19	13	2,790	9¼	9¼	28
19	14	3,070	10¼	10¼	31
19	15	3,360	11¼	11¼	34
19	16	3,640	12	12	36
19	17	3,935	13	13	39
19	18	4,220	14	14	42
19	19	4,500	15	15	45
19	20	4,790	16	16	48
19	21	5,070	17	17	51
19	22	5,355	18	18	54
19	23	5,540	18½	18½	56
19	24	5,820	19½	19½	59
20	13	3,040	10	10	30
20	14	3.350	11¼	11¼	34
20	15	3,660	12¼	12¼	37
20	16	3,980	13¼	13¼	40
20	17	4,290	14¼	14¼	43
20	18	4,500	15	15	45
20	19	4.820	15	16	48
20	20	5,135	17	17	51
20	21	5,450	18	18	54
20	22	5,760	19¼	19¼	58
20	23	6,070	20¼	20¼	61
20	24	6,390	21¼	21¼	64

FRUIT FLY EXPERIMENTS.

By ALBERT H. BENSON AND S. VOLLER.

EARLY last spring the Department of Agriculture considered it advisable to conduct a series of experiments with a view of determining the best method or methods of dealing with the Fruit Fly, and we received instructions to carry out such experiments.

In order to make the work as comprehensive as possible, we decided to carry out a complete series of experiments both in the coast and Downs districts, and, as no departmental orchards were available, arrangements were made with private orchardists for the use of their orchards.

The orchards obtained were situated--one near Sunnybank, on the Southport line; and the other at Birnam, near Toowoomba; the former belonging to Mr. O'Brien, and the latter to Messrs. J. and H. Roessler. No charges were made for the use of the orchards, and both Mr. O'Brien and the Messrs. Roessler gave us every assistance they could; and we consider that the thanks of the Department and of the fruit-growers of the colony generally are due to these gentlemen.

The orchards selected were chosen, firstly, on account of their having been badly infested with the Fruit Fly in previous seasons; and, secondly, on account of their being comparatively isolated, as we deemed that the latter consideration gave us a better control of the experiments, in that the orchards in which they were carried out were not so liable to infestation from outside sources, as would have been the case had there been adjacent infested orchards.

The experiments at Sunnybank commenced on the 15th of September, and continued to the 14th of December, and were confined to peaches of several kinds and to red heart Japanese plums; whereas those at Birnam commenced on the 28th of September, and continued to 24th of January, and included oranges, cherry plums, apricots, peaches, nectarines, apples, pears, plums, Japanese plums and quinces.

At Sunnybank, some 300 individual experiments were carried out, and at Birnam over 1,000.

The object of the experiments, as previously stated, was to determine the best method or methods of dealing with the Fruit Fly; and in order to do this we conducted experiments—

1. To prevent or deter the fly from attacking the fruit.
2. To attract and destroy the mature insects.

The first series of experiments—viz., those in which we endeavoured to prevent or deter the fly from attacking the fruit—occupied by far the larger portion of our time, and the methods adopted were as follow :—

1st. Spraying the fruit and trees with strong-smelling substances that were deemed likely to deter or repel the fly.

The substances used as sprays were many and varied, and included the following :—Sulphide of lime, sulphide of soda, lime, sulphur, wood tar, bone oil, caustic soda, carbonate of soda, whale-oil soap, tobacco, pyrethrum, black leaf tobacco extract, nicotine, and Redwood's specific. Most of these substances were used singly, and, with the exception of Redwood's specific, in various combinations. All the mixtures were applied in the form of a fine spray by means of a Figaro knapsack spray pump, fitted with an 8-foot bamboo extension, and using a triple cyclone nozzle. This outfit worked exceedingly well, and we had no difficulty in thoroughly spraying trees of all the kinds treated up to 14-feet in height. All of the mixtures were applied during the day, sometimes during a moderate breeze and bright sunshine, but

little, if any, damage was done to the fruit or trees thereby, except in the case of Redwood's specific, which slightly discolours the fruit if applied during bright sunshine, but does no injury if applied in the evening or during a dull day.

Many of the mixtures used had a very strong and persistent smell, which was retained on the trees and fruit for at least a week after application, and the smell was not washed out by rain but rather intensified for the time.

2nd. Hanging balls of cotton waste saturated with bone oil and other strong-smelling substances in various trees to determine whether the odour emitted would deter the flies or not.

The result of the first series of experiments may be briefly summarised as follow:—

1. The hanging of cotton waste saturated with strong-smelling substances has not been a success, flies having been seen on fruit within a few inches of the waste, and the trees so treated being as badly infested as any untreated trees in the orchard.

2. Spraying the trees and fruit with strong-smelling substances has been partially successful, certain mixtures having had a distinctly deterrent effect for the time being. The mixtures that proved to be the most deterrent were those that besides having a strong smell adhered least to the fruit. Of all that were tried, we found the following to be most effectual:—

A.—A mixture made as follows:—Boil 2 lb. of sulphur and 1 lb. of 98 per cent. caustic soda in 2 gallons of water till the sulphur is dissolved, and a mixture known as sulphide of soda is formed. Add 6 lb. of whale-oil soap, 80 per cent.; and boil for half an hour, adding boiling water to make 5 gallons of mixture; then add 40 fl. oz. of black leaf tobacco extract. Next add water to make 40 gallons, and it is ready for use.

B.—A mixture made as follows:—Dissolve 1 lb. of whale-oil soap, 80 per cent., in 4 gallons of boiling water. When dissolved, add 25 fl. oz. of bone oil and mix well; add water to make 40 gallons, and it is ready to use.

C.—A mixture of equal parts of *A* and *B.*

D.—Redwood's specific.

In conducting the experiments we found that some of the sprays used had distinctly beneficial effect other than deterring the Fruit Fly. Thus: *A* destroyed numerous young scales; *B*, aphides and plant lice of various kinds; and the black leaf tobacco extract and nicotine proved to be effectual remedies for aphides of all kinds, as well as several other insects. These tobacco washes are of special value to gardeners, as they do not injure the tenderest foliage.

No spray used has, however, been a complete success, even though numerous applications have been made; but those mentioned have certainly the properties of keeping the fly from the fruit for a certain time after their application, as in the case of the same varieties of fruits, on trees that have been sprayed, we have been unable to detect a single fly at work (viz., laying its eggs), whereas they were numerous and busy on adjacent trees. No spray has, however, been lasting, as where the applications have been from a week to 10 days apart, part of the fruit has been infested, but not to the same extent as in untreated trees, thus showing that the applications must be frequent during the ripening of the fruit. We were not able to definitely determine the time that any spray acted as a deterrent, as unfortunately one of us (Mr. Voller) was laid up with a

severe illness just at the critical time—viz., from Christmas to the conclusion of the experiments; so that it was impossible to keep as accurate a record as could have been wished from that date, as previously Mr. Voller had devoted the whole of his time to work at the orchard, and this it was impossible to keep up.

We believe that careful and frequent sprayings will protect a considerable portion of the crop, but at the same time we are confident that to be of any value the spraying must be very carefully carried out, and must be backed up by destroying all infested fruit and taking every possible precaution to keep the insects in check.

The second series of experiments were conducted with a view of determining the possibility of attracting, catching, or poisoning the mature insect. In this respect we are sorry to say that we have had no success, as we have failed to attract the flies. We have used highly scented sticky baits, highly scented poisoned baits, and poisoned fruit baits; but, though numerous insects of various kinds have been caught or destroyed, the Fruit Fly has escaped. So far, we cannot find out if the mature insect feeds on anything, as, with the exception of seeing it occasionally apparently sucking the juice exuding from a puncture it has made in the fruit, we have never seen it attracted by or feeding on anything. We ask the co-operation of all fruit-growers in determining whether the Fruit Fly can be attracted or not, as, if it is found that the fly has a preference for any food, the poisoning of that food will be the means of greatly diminishing this pest.

In the course of the experiments we have, however, noted that the flies are especially attracted to certain varieties of fruits—especially early pears and apricots—in which to lay their eggs, and we have taken advantage of this fact to use some of these trees as trap trees. We allowed the flies to attack the fruit on these trees without molestation, and as soon as the larvæ developed we gathered and destroyed by boiling all of the fruit from these trap trees. In this way alone we destroyed many thousands of the earlier crops of the insects, and are confident that the result of this destruction at Birnam was that the larger portion of the fruit was marketed in a sound condition; whereas had we allowed the fly to develop unchecked—first in the oranges, then in the red American plums, and finally in the early pears and apricots—the whole orchard would have been badly attacked, and there would have been little sound fruit.

We strongly advise the use of trap trees in addition to the gathering and destroying all grub-infested fruit, especially early in the season; and we feel confident, from the experience gained by these experiments, that if these precautions alone are systematically carried out the ravages of the fly will be considerably diminished. At the same time, we strongly advise the destruction of useless varieties, which are only a breeding-ground for the fly, and the compulsory destruction of all infested fruit, as the present method of allowing infested fruit to lie under the trees and rot is simply increasing the pest wholesale.

No experiments were made to destroy the larvæ or pupæ of the fly in the ground after their having left the fruit, as we did not consider this feasible in the case of the orchards in which the experiments were conducted, nor do we think this method of treatment likely to be of much value even should it turn out to be efficacious, unless it is systematically carried out. Under any conditions it is bound to be an expensive process, even though the material used to destroy the insects would have a manurial value, as would be the case were kainit used.

It is our intention to continue these experiments next season, as the destruction of this pest is of such vital importance to the fruit-growing industry of this colony that it behoves us to leave no stone unturned that may lead to the discovery of an effectual means of dealing with it.

THE EXPORT OF FRUIT.

QUEENSLAND is without question a country which is capable of producing a vast quantity of exportable fruit, and to whose capabilities for an expansion of the fruit-growing industry there is practically no limit. The oranges of Maryborough, the mangoes of Mackay and Bowen and other Northern centres of horticulture, the bananas of Cairns, the pineapples and passion-fruit of the whole seaboard, the grapes of Roma, the strawberries and native gooseberries of the Blackall Range can be produced by tens of thousands of cases. All they require is a big market. That market is the market of the world—England. London, Liverpool, Manchester, Bristol, Dublin, Edinburgh, and scores of densely populated cities of Great Britain are capable of absorbing a vast amount of fruit—far more than the present producers of fruit in Australasia are able to supply. But, say the pessimists, Queensland is too far from London to make a trade in perishable fruit a certain success. Two months is too long for fruit to remain in a ship's hold, and to expect it to reach London in a perfect condition. All we say in answer to this is: "Has it been done successfully in any case?" It has been repeatedly done successfully, and therefore it can be done again. Why do failures occur? We do not go so far as to say that nobody in the colony understands how to pack and ship fruit to ensure success, but what we do say is this: We have in Queensland a gentleman whose whole life has been spent in the study of the fruit business—from the first planting of the tree to its final harvesting, packing, and shipment.

Mr. Benson, the Fruit Expert attached to the Department of Agriculture, has an experience and qualifications which probably few fruitgrowers in the colony possess; and in this one matter of exporting our fruits—in the choice of proper seasons, conditions of ripeness, suitability of packing material, and of cases—his opinion and instruction cannot fail to be of great benefit to all exporters. But, to leave Queensland for a moment, which, be it remembered, is 12,000 miles from London by the shortest route, 16,000 by the longest, let us consider what is being done in Jamaica, one-third of the distance away from the world's market.

Since the serious trouble in connection with the sugar industry in the West Indies, the Jamaicans have turned their attention to the export of fruit, especially of pineapples and mangoes, and the question of the development of the fruit trade between that island and England is exciting very great interest at present in local commercial and agricultural circles, and many merchants there are doing all they can to push the matter. To show how an energetic and intelligent business man can forward the interests of the colony while in England, take the visit of Mr. Aston W. Gardner, a Jamaica merchant, to the old country. It will be seen that he observed numberless opportunities for the extension of trade, and consequently was, on his return, able to give those having business connections with the colony a better idea of the conditions prevailing there than reams of correspondence could do.

For many months Mr. Gardner moved about England, inquiring, *inter alia*, into the possibilities of the fruit trade. Several circumstances struck him in this connection. One was that the most farseeing business men in England took a great interest in Jamaica. They have a firm belief in the prosperous commercial future of the colony, yet, be it remembered, many of these men have lost heavily by the ventures they have undertaken. The cause of their losses, however, they attribute to the want of enterprise and intelligence of the fruit-growers and shippers, who fail to recognise to the fullest extent their position and responsibilities.

Mr. Gardner went over many of the largest fruit warehouses in England which handle fruit from Australia, California, the Canaries, &c. Side by side with lovely fruit, packed to perfection, he saw fruit from Jamaica. It was wrapped in ugly yellow paper, which had become soiled and saturated with the oil of the rind.

To quote the *Tri-weekly Gleaner* (Kingston): Mr. Gardner was shown some Jamaica fruit. "Look here," said a man, whose name is known in every fruitgrowing country in the world, "here is an orange that is still actually green; here is one twice the size of that; there is one with a bruise," and so on, and the sins of his countrymen stood out before Mr. Gardner with appalling distinctness. The bananas looked well enough, but he was told to look at the opposite side of the bunches, when he saw that the fruit had been knocking against the side of the crate and had become discoloured. The head of one firm remarked with pleasant satire that the Jamaicans must pull down a pitch-pine house to make one crate. All whom he saw impressed upon him the absolute necessity of every kind of fruit being packed according to the latest methods in use. "You West Indians," they said, "seem to be the most ignorant class of producers on earth. You are generations behind in everything relating to the fruit trade." The judgment was severe, but the men who gave it knew what they were talking about.

The next thing which impressed Mr. Gardner was the singularly vast market there is in England for all kinds of tropical produce. The present supplies only reach the well-to-do class, and that chiefly in London. The great provincial towns are practically without tropical fruit, and the bananas that he saw in the markets and stores there were scarcely worth the name. The middle and working classes have never been given the chance of becoming consumers of colonial fruit, and they form a potential market of enormous proportions. It is astonishing what they do buy in this direction, and how they are satisfied with what an American labourer would throw into the gutter. In this connection Mr. Gardner relates an amusing experience of his in London. He came across a street vendor hawking what he discovered on close inspection to be mangoes. They were the most wretched-looking specimens of the fruit a West Indian could conceive of. A colloquy with the man induced a crowd to gather, and Mr. Gardner's example in buying some was followed by others, who asked the hawker how they were to be eaten. "Blow'd if I know," he replied, scratching his head, "I never saw them till this morning."

Mr. Gardner, we believe, has determined to aid the exportation of oranges to England by placing it within the power of the Jamaica producer to use the special type of wrapping-paper used by the Californian and Mediterranean grower; and he sought out in England a special design of crate that might be used with the greatest advantage in the trade. He brought out thirteen of these with him, and he is making an experimental shipment of fruit by the next mail steamer, besides testing their capabilities in the island. It is well that this and other efforts should be made. Before the trade with England can be successfully engaged in, there are certain fundamental requirements which must be attended to. The fruit must be well picked; it must be well packed; and it must be properly shipped. And the standard for these must be the standard of the most advanced fruitgrowing areas of the world.

THE PROBLEM OF FRUIT PRESERVATION.

THE *Jamaica Tri-weekly Gleaner* publishes the following letter from Dr. William Johnson Calder, M.B., M.S., on the subject of a discovery, which the doctor alleges to be highly important, tending to overcome the difficulties attending the morbific changes which take place in fruit in consequence of the heat generated in ships' holds:—

Jamaica's staple resource, rum and sugar, being now doomed, and men being made to understand and feel that their prosperity in this country depends on several industries and not the products of the cane alone, also from the force of necessity being compelled to enter into fruit cultivation, it appeared to me

that the only trouble, if trouble it be, lay in getting a quick system of transportation in order to overcome those morbific changes which take place in fruit from the time of its shipment in this country to its arrival in England. With the view to overcome that loss, as well as to enable the marketing of the fruits in perfect order in England where they will be fairly dealt with, and not in America where every imposition is placed upon them, I resorted to a series of experiments that will not only facilitate growers in the long transportation, but entirely overcome those septic changes supposed by past experimental shippers to be due to the heat generated in the hold of a steamship.

Mind you, I do not wish that my readers should violently conclude that I consider the heat of the hold does not produce some change in the fruit, but I would state that the heat so produced can have no other effect than the heat of ordinary fire, vapour from a kettle, or that of the sun directly applied. It is not, therefore, the heat of the hold that I in my research wish to deal with, nor is it those noxious gases that some advance as the cause of the decomposition, but a bacteriological change which the fruit undergoes in the ship's hold. By taking the circulation of a plant and its fruit into consideration, I directed my line of research accordingly, and I have pleasure to announce through your columns that I have discovered a process whereby on the application to the cut ends of the orange immediately as they are removed from the tree, and the envelopment of the fruit in an antiseptic paper afterwards, all putrefactive changes are arrested and the fruit remain pure and sweet.

The question may arise in the minds of sceptical ones, whether the "stem preserver," as I have designated my paste, and the antiseptic paper for wrapping will not be injurious to the being who eats the fruit so preserved? In answer to this, I say, "No, by no means." For the substances used by me in my preparations are not deleterious to man if they were even absorbed, but as a fact they cannot be absorbed, through the skin and stem of the fruit; they act as preventives and destroyers of bacteria which riddle their way into the fruit and cause putrefaction.

What I desire to bring before the agricultural society or anyone interested in the future welfare of the fruit industry of the island is this: That I shall be happy to apply my process of preservation to any experimental shipments of fruit to England that they may wish to make, and, when the fruit arrives there, submit it for analysis under the supervision of the *Lancet* and British medical journals to prove its wholesomeness, and thus remove any doubt that may be cast upon it otherwise. In conclusion, I claim for my research—

1st. That the edible portions of the fruit so treated are free from the absorption of the substances used in its preservation.

2nd. That the decomposition attendant on bruised fruit is allayed, that fruit becoming hard and firm.

3rd. That the exudative matters from decomposing bruised fruit on reaching the medicated paper is at once converted into an aseptic fluid which, instead of causing the surrounding fruit to rot in the box as is the case in the present system of packing, actually preserves them.

4th. That if the packages of fruit get wet, instead of the fruit softening and rottening as under the present system, it becomes firm.

5th. That of necessity the ripening of the fruit is allayed.*

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*This matter of the antiseptic treatment of fruit for export has been under the consideration of experts in all the Australian colonies for several years, and all are agreed that there is a great deal to be said in its favour, but it is a large and important subject which it is necessary to consider with the utmost care, in order that the best results may be obtained.—Ed. *Q.A.J.*

Botany.

CONTRIBUTIONS TO THE FLORA OF QUEENSLAND.

BY F. MANSON BAILEY, F.L.S.,
Colonial Botanist.

Order GRAMINEÆ.

PANICUM, Linn.

P. piligerum, *F. v. M.* (Benth. Flora Austr. VII., 477.) Stems from a decumbent and branching base ascending to above 2 ft. Leaves more or less hairy, 6 to 8 or more inches long and about ¼-in. broad, tapering to fine points, the margins nerve-like; sheaths hirsute, the hairs arising from a tuberculose base. Panicle of 3 to 5 erect simple branches 1 to 2 in. long. Spikelets ovoid, acute, nearly 2 lines long, alternate along the broad flat rhachis, but rather distant so as to appear in a single row. Glumes hairy, the outer one short, 3-nerved; 2nd and 3rd 5-nerved, 3rd rather narrower than the 2nd, but both empty and equal in length. Fruiting glume shorter, coriaceous, obtuse, without any or only a very minute and deciduous terminal point, minutely transversely rugose.

Hab.; Mackay, *L. G. Nugent.* I believe Mr. Nugent's specimens to be identical with the *P. piligerum* of the Fl. Austr., so have extended the description there given from the specimens now to hand.

Order FUNGI.

SPHÆROTHECA, Lév.

S. Castagnei *Lev.* On both surfaces mycelium effuse, arachnoid, often evanescent; perithecia scattered, sphæroid, minute; appendages numerous, short, turned upwards. (Determined by Mr. G. Massee, Royal Gardens, Kew, England.)

Hab.: On the leaves of Cucumber plants in a garden at Toowong. Found on the foliage of plants belonging to several other orders in Asia, America, and Europe.

ÆCIDIUM, Pers.

Æ. Plectroniæ, *Cooke.* (Grev. X. 124; Sacc. Syll. Fung. VII. 795.) Hypophyllous. Heaps rotundate, nestling on orbicular discoloured spots. Peridia few, somewhat prominent, margins sub-entire, pale. Spores yellow (?).

Spermogonia on the upper surface of the same spots which bear the peridia.—*Cooke, l.c.* (Determined by Mr. G. Massee, of Kew, England.)

Hab.: On leaves of *Plectronia barbata,* Endeavour River, *Dr. W. E. Roth.*

PHOMA, Fries.

P. ampelina, *B. and C.* (Cooke, in Handb. Austr. Fung. 347.) Subcuticular, hysteriiform, swollen; sporules fusiform, 12 μ long. *Sphaceloma ampelinum,* De Bary. (Conidial form.) (Determined by Mr. G. Massee, of Kew, England.)

This destructive pest made its appearance in a vineyard near Brisbane during the early part of this summer; and, as probably much of the vines so diseased may at present be lying about the vineyard, this opportunity is taken to advise that all such diseased shoots be gathered up and burned, and, when the vines first burst into growth another year, that their shoots be dusted with slacked lime which has been finely powdered. This operation should be repeated at intervals of about a fortnight. Alternately with the lime may be used flowers of sulphur and lime; this is supposed to be the best preventive for the pest.

P. sycophila, *Massee* (n. sp.).

Description not yet to hand.

Hab.: Found on leaves of an indigenous *Ficus* growing at the Endeavour River.

Plate C.

PRATIA ERECTA.

PESTALOZZIA.

P. vermiformis, *Massee* (n. sp.)

Description not yet to hand.

Hab.: Found on the leaves of one of the indigenous *Eugenias*.

CERCOSPORA, Fres.

C. circumscissa, *Sacc.* (Syll. Fung. IV. 460.) Small spots on both surfaces, circular, pale, dry, at length cut round and falling out, leaving round holes; hyphæ fasciculate, nodulose, ferruginous; conidia acicular, much attenuated upwards, 50 x $3\frac{1}{3}$ to 4 septulate, rather dark. (Determined by Mr. George Massee, of Kew, England).

This fungus, which during the past year might have been noticed from the circular holes it has left in the leaves of the peach-trees about Brisbane, does not seem to have considerably interfered with the productiveness of the trees, and a few sprayings with one or other of the many fungicides would have kept the trees clear of this as well as the other fungus often prevalent on peach-leaves—viz., *Uromyces amygdali*, Cooke.

PLANTS REPUTED POISONOUS TO STOCK.

By F. MANSON BAILEY, F.L.S.,
Colonial Botanist.

PRATIA ERECTA, Gaud.

A small erect plant, often producing a cluster of stems from the base, usually about 4 to 6 inches high, but on rich land far exceeding that height. Stems usually well clothed with oblong, toothed, stalkless leaves generally under 1 inch long, bearing pale, dirty-white, shortly-stalked flowers in their axils, some of which will be observed to be male and others female. The fruit is almost globular or oblong, attaining nearly half-an-inch in length. (*Vide* Plate.)

This plant, which is found in most of the Australian colonies, has frequently been forwarded to me as a suspected poison-plant. In 1890 I visited Laidley, where a number of cattle had died, owing, it was thought, to having eaten some poisonous weed. In the paddocks where the deaths had occurred, I found a luxuriant growth of the plant in question. The plants were green and fresh, 6 to 9 inches high, and offered a tempting bite to the unsuspecting animals; and in my report at the time I stated that I considered the deaths had been caused from the cattle browsing upon it.

The genera *Lobelia*, *Pratia*, and *Isotoma* are closely allied, and possess similarly highly poisonous properties. For instance, we are told that in the West Indies horses burst after feeding upon *Isotoma longiflora*, Prest., and that should any of the juice of the plant touch the lips or eyes it will produce violent burning inflammation.

Lobelia pratioides, Benth., is considered poisonous to stock in Victoria, and Dr. T. L. Bancroft found *Lobelia purpurascens*, R. Br., which is common in South Queensland, to contain similar properties to those possessed by *Lobelia inflata*, Linn., the "Indian Tobacco." A teaspoonful of the infusion of the leaves and seeds of this latter plant has been known to prove fatal in 5 or 6 hours.

In the *Agricultural Gazette* of New South Wales the Stock Inspector at Forbes reported that sheep which had eaten greedily of *Pratia erecta* shortly afterwards showed signs of poisoning, and died in about 12 hours.

Popular Botany.

OUR BOTANIC GARDENS.

No. 9.

BY PHILIP MAC MAHON,
Curator.

THE illustration which forms the frontispiece to this number of the *Journal* is taken from a point which, if you have the plan published with the first of this series, you will find in the square marked F. 4. You may reach it by entering at the George-street gate, and keeping along the main walk until you come to a point where two walks diverge, each sloping downwards to a hollow along which there ran, apparently, in former days a creek or water-course. From this point may be commanded a view of much interest, and many plants of botanical, horticultural, or economic value come immediately under notice. To the left of the walk which leads straight down, and along which the three young ladies are advancing, will be seen a trellis of roses of climbing varieties. Ten years ago these were old, exhausted, and almost flowerless, and the only thing which seemed possible with them was to grub them out; but it was decided to give them a chance. They were carefully root-pruned, all useless roots being cut back as far as possible; all dead wood was removed; the branches which remained were spread out on a trellis; the stronger shoots of the tea roses were encouraged to ramble at will; and insecticides were applied, each stem being washed with an emulsion of soap and kerosene diluted in the proportions often published in the *Journal*. The result was that the plants acquired a new lease of life, and many a bushel of roses they have yielded since then.

There is one rose on this trellis of which particular mention may be made. Its name is Lamarque. The flower is pure white, and therefore in continual request for social functions. Most of its class will not take kindly to the pruning-knife, but Lamarque is different. You remember seeing in gardens, especially in the old country, apple and pear trees trained on trellises and "spurred"—that is, briefly, the side shoots cut back close to the main branches within 2 or 3 inches. Treated in this way, Lamarque produces immense numbers of fine flowers, and a well-grown plant on a trellis presents a beautiful appearance. Some native shrubs, such as *Randia Fitzalani*, which are almost always infested with scale, were growing in this border, but have now been removed, and there are, consequently, gaps caused by this and the recent removal of sundry older roses. These gaps will, at the earliest suitable time, be filled up, and the older roses replaced by others.

It is always difficult to deal with an old garden so as to obtain harmonious and artistic effect. It is much easier to lay out a new one. Great care and gradual thinning out and replanting, however, will work wonders in the course of a few years. The great thing is to fix definitely what you want, and gradually work up to it, and, before you plant a tree or shrub or climber, to have a definite idea of the size, form, colour of foliage and flower, &c., which it will present in the course of some years, and how these will contrast with their immediate surroundings and even with the remote background.

From where we stand, looking along the straight walk just referred to, but slightly to the left, we note against the skyline a large Sugar Palm (*Arenga saccharifera*). A great old warrior this: stricken in years, his end is not far off. A fine self sown staghorn fern grows upon his stem, and the spaces formed by the bases of the long since dead leaves are filled with ferns of several species, but a fine bunch of flower-buds hangs from the old Palm. When these open into

dull yellow flowers laden with pollen, the bees will have a rare time; and even when the flowers drop off and litter the ground, the industrious little insects will descend and cover themselves with the pollen. Has anyone of the readers of these Notes observed that the nectar of some flowers makes bees irritable and very much inclined to sting? There is a creeper (the location of which will be indicated presently) called *Antigonon leptopus.* Bees working at this plant have, on several occasions, stung the writer when they have been disturbed, although he has often disturbed bees on other plants with impunity.

You notice the gleam of scarlet to the right of the palm just mentioned? That comes from the Queensland "Tulip Tree" or "Fire Tree," the latter being the most appropriate name. It can claim to be one of the most beautiful and singular flowering trees in the world. The stalks bearing the flowers spring directly from the branches, often from the main branches. From each main stalk branch five or six secondary ones, and on each secondary is an umbel or whorl, like a brilliant crown, consisting of about sixteen flowers. These are situate on short pedicels or stalks which radiate like the spokes of a wheel; and from these, the flowers turn up at right angles Each of the segments or divisions of the coloured envelope of the flower (perianth) has a curious spoon-shaped end which contains the anther of the flower; and when these fall away, certain black glands around the base of what will presently become the seed-vessel only add to the beauty of the flower. The student of botany, or indeed any lover of plant-life, will be amply repaid by a study of this curious flower in its several phases.

Some years ago there was a controversy as to a suitable national flower for Queensland. The Fire Tree (*Stenocarpus sinuatus*) might be very appropriately accorded this honour.

Carrying the eye to the left, we are surprised at the immense varieties of shades of green, and the management of these is no small matter in the creation of that picture on a large scale called a garden. Below the Sugar Palm, and nearer to us, there is a large clump of *Strelitzias.* To the left is a fine date palm with clusters of orange-coloured fruit, easily distinguishable from here, showing well against the grey foliage. A gaunt dead *Arenga*, with fern-clustered stem, stands out in contrast with the greyish-green of a tree of *Thuya pendula* which stands behind. Close by is the ponderous sombre-hued and formal-looking *Frenela robusta* (or Cypress Pine), of which we shall have more to say anon. Two gaunt silky oaks raise their jagged tops to the sky-line, and stand sentinels over a group of *Strelitzias*, of three species, and *Pandanus.*

Then we catch a view of the green slope of the hill with bright beds of Crotons, masses of shrubs, amongst which stands out just now *Allamanda Schottii*—thousands of yellow flowers amongst the dark glossy foliage seeming from this like primroses dotting a grassy bank. The blue *Plumbago capensis* also stands out conspicuously. On the slope is seen the white bole of a Royal Palm (*Oreodoxa regia*), planted eight years ago when only 10 inches high, and now over 20 feet high, and 8 feet 2 inches in circumference at the base. Beyond, are the tall Bunyas, worn out by their forty years of struggle against adverse, because unnatural, conditions; a British Oak standing alone beyond the roof of the aviary, and thriving as sturdily as the British race beneath these sunny skies; and through the many greens of the foliage gleam the grey cliffs of Kangaroo Point.

Carrying the eye still to the left past the cool aisles of bamboo surrounding the fern island (not shown in the illustration), we note two plants which will bear mention. One is the very beautiful creeper which I have before referred to as making bees which visit it irritable. It covers the top of a summer-house, and seen from here is a beautiful pink patch amongst the many tints of green. The other is the Traveller's Tree of Madagascar, which holds up its broad flat leaves like a fan and always forms a very conspicuous object in the landscape. You remember the stories you read as a child of these trees storing up the moisture and saving the life of the weary traveller in the

desert? But this is something like M. de Rougemont's providential escape by means of the bottle-tree of Northern Queensland as related to a wondering British public. The sheathing bases of the leaves do certainly contain water—rain water, which flows into them and is retained. But then the Traveller's Tree is always found within easy reach of water, so that there is really no great necessity ever to draw upon its stores. A few minutes prior to writing this article, the writer extracted a pint of drinkable water from a small specimen by making an incision in the base of the leaf-stalk. As an ornamental tree it is unique, and a good specimen never fails to elicit surprise. It is easily grown, though slow to attain large dimensions. It has been raised from seeds here several times, and it is quite easy of cultivation. It can also be propagated by taking off the side shoots; but this is not so easy a job as it looks, as they usually spring from deep down.

You will note on the slope of the hill, directly in front, two tall flower-spikes of *Furcrea gigantea* (or Mauritius Hemp). This has been already figured and described in the *Journal;* but as it is only occasionally seen in flower, it may be mentioned here. It is difficult to believe that this is a mere flower-spike. Standing between 35 and 40 feet in height, 6 to 8 inches through at the base, branching elegantly to the summit, and covered with white flowers, it is a bouquet for a giant.

In the economy of the vegetable world, the chief point aimed at in the growth of a plant seems to be the perpetuation of the species; and we have seen from time to time that the means used for obtaining this end are often complicated and remarkable to a degree. There are many plants which though provided with flowers having apparently all the parts usually found in other flowers, yet seldom produce fruits; and have to resort to some other means to effect the propagation of their respective kinds. Of such is our tall friend, the *Furcrea.* The flowers drop off, but the stem becomes clothed to its summit and to the ends of its smallest branches with bulbils—*Furcrea* plants in miniature—having their leaves laid one over the other in the way you notice when you cut an onion down the centre. These bulbils remain on the stem for quite a long time, sometimes sending forth leaves of 5 or 6 inches in length. At last they become so weighty that they break down the stem and are scattered about the ground, where each one takes root and becomes an independent plant. The parent plant dies or becomes a stunted bushy thing, like one on the upper side of the bed where these are. A species of European lily (*Lilium bulbiferum*) follows this course also in the propagation of its species, and it has been clearly demonstrated by Kerner and others that when, for any reason, the insects necessary to the fertilisation of a particular flower become extinct in the districts in which the plant is found, the plant often takes to producing bulbils as a means of averting extinction, whilst the same species, if placed under conditions where ripe fruits and perfect seeds are formed, produces no bulbils.

The foreground of the picture is a triangular piece of ground which, some few years ago, was very swampy and sour, and difficult to get trees to grow in; indeed, there were no specimens of any size, or likely to become of any size, in it, except at the right-hand further corner, which is elevated. Drains were run through it, and these were packed with dead bamboos, which were removed from the clumps close at hand. Drainpipes would, of course, have been the proper thing, but they would have cost money, which was not available. When as many bamboos as could possibly be pressed into the trenches within 10 or 12 inches of the surface had been got in, the sods, which had been taken off in the first instance, were laid over them, grass side downwards, and then the earth was firmly trampled in. These made excellent drains, which have been in use for over four years, and, except for an occasional slight subsidence, easily rectified, do their work admirably, and have completely altered this piece of ground, so that now young palms planted out there are flourishing, and will soon do much to add to the tropical character for which our Gardens are celebrated.

In planting out young palms, the greatest care should be taken not to injure the roots. There are no plants more impatient of root injury. Should a root become bruised, it should be cut cleanly off with a very sharp knife. The hall-mark of a bad gardener is a blunt knife.

Palms should be planted when quite young. Some nine years ago, here, there were certain palms in pots which it was decided to plant out; they were about 5 feet high. They have made some growth since then, but palms of similar species, about 8 inches high, were planted near, and these have shot up and are now four times the height of those which started with (as it would appear to the uninitiated) all the conditions in their favour.

It is a good thing, in planting palms, to create at first a close jungle-like atmosphere around them. This is secured here by placing three sticks tripod fashion over each, and then wrapping upon these a piece of the matting which the drapers receive as packing with their imported goods. The plants are then syringed, and the result is a close warm atmosphere beneath the little tent-like covering. This is opened on the shady side after the lapse of a few days, and, as the plant gains strength, it is gradually removed. Under these conditions root growth commences at once, and the leaves respond by unfolding and commencing active growth. This method of treatment is, of course, applicable to any tropical plant to which it may be desirable to give a good start in life.

Tropical Industries.

QUEENSLAND COFFEE.

The recent small shipment of 5 cwt. of coffee from this colony to England was made, not so much with a view to testing its market value, as with the object of obtaining the opinion of experts in London as to its quality, and to elicit some information concerning the improvement of that quality. The price obtained (48s. per cwt.) is low, but with the enormous output of Brazil and the extension of the industry in Mexico, Peru, Panama, the Philippines, &c., it was not to be expected that a high price would be realised, notwithstanding the fact that the sample was pronounced to be, although small, very pretty coffee, well cured and dried, and comparing favourably with Central American. When we consider that West Indian coffee is purchased in Jamaica by the merchants at from 15s. to 20s. per 100 lb., and is sold on the Continent at from 24s. to 25s. per 100 lb., Queensland may be congratulated on obtaining more than double the highest figure here quoted in an already glutted market.

But why should we send away our coffee? We import about £7,000 worth (equal to 104,901 lb. of raw and 52,955 lb. of roasted coffee) every year, and it seems to us that every endeavour should be made to overtake our own consumption, and, of course, that of all the other colonies of Australasia, before sending away shipments to compete in the home market with an article produced by the cheapest of coloured labour in other countries. One hundred acres in full bearing would supply the present demand in Queensland, and 500 acres under coffee would probably meet the Australasian requirements. At present there are not more than 300 acres planted, of which perhaps 50 acres are in full bearing. At the best 1 ton per acre may be gathered from trees over 4 years old.

In December, 1897, Mr. F. Hepburn, an ex-West Indian coffee-planter, put down the produce of 50 acres, containing 1,000 trees to the acre, at 45 tons. This, he said, would yield, at 8½d. per lb., over £3,540. Taking the above estimate of £7,000 as the imports of coffee into Queensland, this would mean 100 acres of

1,000 trees per acre, yielding 2 lb. per tree. Thus there are at the present moment not sufficient coffee plants in bearing to overtake the Queensland consumption alone for the next two years. Meanwhile the population of the colony is rapidly increasing, and this area will be quite insufficient for the future. The outlook for coffee-planters is, we think, for many years, as hopeful as was that for sugar-planters before they had produced sufficient for the colony's requirements. That Queensland is eminently suited for successful coffee-planting, no one can now doubt. The industry has grown beyond the experimental stage, and now it is only a question of good management and economical working of the plantations. Mr. Newport, the Government Expert, will no doubt succeed in his work of instructing planters in the most up-to-date methods of planting and curing. There is no leaf disease here, the climate and soil are adapted to the plant, and, if there be any difficulty, it will be in harvesting, owing to the present scarcity of pickers, but this is a matter which, like all other problems in agriculture, will settle itself as the occasion arises.

COFFEE NOTES.

COMMON South Sea Island coffee has been lately sold at 31s. per cwt., or a fraction over $3\frac{1}{3}$d. per lb.

From *Planting Opinion* we take the following figures, supplied by a correspondent to that journal, relating to parchment coffee:—

A *standard bushel* of cherry turns out 45 to 47 per cent. of parchment—*a box* (14 *inches cube*) turns out 52 to 60 per cent.

192 bushels cherry = $73\frac{1}{2}$ parchment.

2·60 bushels of cherry are required to give one of parchment dry enough for pounding out, or about 40 per cent. only against Ceylon 45 per cent.

The least amount of heaping will make a difference.

The writer of the notes says that he found it most difficult, on account of the popularly conceived idea of 2 bushels cherry equals 1 of parchment, to get a club of small native cultivators to accept 40 per cent. as the correct out-turn until the matter was proven to them beyond all question.

There is another popular error that needs discussion, viz.:—"Parchment coffee increases in quantity as it dries."

Mr. Brown, the correspondent alluded to, says:—I have found from careful tests that it does not. There is a slight increase the first day or two after washing and measuring, but this increase soon changes to a decrease as the drying goes on.

COFFEE MARKET REPORT.

(*To 13th January*, 1899.)

CEYLON.—*Plantation.*—17 casks 9 barrels sold: Triage, 41s. to 43s.; smalls, 44s. to 55s; low middling, 78s.; middling, 100s. to 101s.; fine middling and bold, 104s. to 112s.; peaberry, 75s. to 110s.

EAST INDIA.—20 bags bought in.

NYASSALAND.—77 bags partly sold: Ordinary mixed, 34s.; fine ordinary, 48s.

MOCHA.—138 packages bought in.

JAMAICA.—8 barrels 27 bags mostly sold: Ordinary, 32s. 6d.; soft greenish, 54s. 6d.

TRINIDAD.—27 bags pale sold at 37s.

COSTA RICA.—821 bags mostly sold: New crop, mixed to fine ordinary small, 28s. 6d. to 44s.; fine fine ordinary, 45s. to 52s.; low middling dull greenish, 53s. to 58s. 6d.; middling, 62s. to 63s.; good middling to good coloury, 70s. 6d. to 77s. 6d.; good to fine bold, 81s. to 94s.; peaberry, 71s. to 95s.

Guatemala.—733 bags partly sold: Smalls, 28s. 6d. to 29s.; fine to fine fine ordinary dull greenish, 42s. 6d. to 48s. 6d.; middling, 55s.

Vera Paz.—Of 1,719 bags offered, 480 bags sold: Mixed small, 26s. to 29s. 6d.; ordinary to fine ordinary pale and brownish, 30s. to 38s. 6d.; fine fine ordinary, 43s. to 46s. 6d.; middling, 61s. 6d. to 70s.

Mexican.—170 bags sold: Damaged pale, 30s. to 33s. 6d.; sound, 35s.

Venezuelan.—Of 486 bags offered, 150 bags sold: Ordinary, 41s. to 42s. 6d.; low middling grey, 55s.

Colombian.—2,388 bags partly sold: Ordinary mixed and damaged, 28s. 6d. to 40s.; fine to fine fine ordinary pale and pale-grey, 38s. to 51s.; soft greenish mixed red, 52s. to 58s.; middling to good middling coloury greenish, 60s. to 71s.; bold, 77s. to 93s.

Guayaquil.—Of 1,375 bags catalogued, 300 bags sold: Damaged pale, 33s. sound pale, 35s.; greenish, 44s.

Brazil.—260 bags washed Santos sold: Good at 44s. to 45s.; small, 33s. —landed terms.

Receipts in Rio and Santos.

Since 1st July—	1898-9.	1897-8.	1896-7.	1895-6.
	Bags.	Bags.	Bags.	Bags.
Rio ...	1,914,000	2,832,000	2,305,000	1,689,000
Santos ...	3,959,000	4,597,000	3,713,000	2,473,000
Total ...	5,873,000	7,429,000	6,019,000	4,162,000
Crop ...	...	10,461,000	8,680,000	5,489,000

COFFEE LEAF DISEASE IN AFRICA.

As we Queenslanders are congratulating ourselves that the coffee leaf disease has not put in an appearance on our little plantations, so did the Central Africans jubilate until just lately. The Liberian coffee-trees at Mbweni (says the *British Central African Times*) bear the unmistakeable stamp of the well-known coffee leaf disease (*Hemeleia vastatrix*). This disease is a fungus which first attacks the under sides of the leaves, causing spots or blotches, at first yellow, but subsequently turning black. These blotches are, on examination, found to be covered with a pale orange-coloured dust or powder which easily rubs off. The blotches gradually increase in size till at last they have spread over the leaves, which then drop off, leaving the trees in a short time quite bare, in which state they are, of course, unable to produce crops, or bring that which may already have been produced to maturity. Its ravages in Ceylon in the eighties converted hundreds of acres of beautiful Arabian coffee into withered sticks, as if a fire had raged through the fields. The whole of the Eastern world was more or less affected from Ceylon, but, as far as we know, this is the first actual appearance of the disease in Zanzibar. The Liberian variety is not supposed to be subject to its attacks, and this makes its appearance at Mbweni all the more interesting. Otherwise the trees there show a most robust and healthy growth in spite of dry weather.

Should the coffee leaf disease spread over British Central Africa, the effects cannot but be disastrous, and cause serious loss to many planters who have spent very large sums in starting and extending their plantations.

The *British Central African Gazette* last year gave its readers an excellent summary of planting operations in that portion of Africa, and we regret that it escaped our notice at the time. Still, whatever interests coffee-planters in other parts of the world cannot fail to be of interest and service to our Queensland planters, whom we desire to see flourish and to assist in every possible way.

The following is the summary we allude to, and is designed to give outsiders in other planting countries some rough idea as to what is being done in coffee in British Central Africa:—

We have been freely supplied with information and statistics by all the planters we have applied to (except one). Should we have omitted to mention any plantation now in existence, it is through inadvertence.—Ed. *B.C.A. Gazette.*

NAMASI DISTRICT.

The agent of Mrs. A. L. Bruce at Namasi has now about 200 acres of coffee planted, and a clearing of 70 acres ready to plant out. From what is seen of this plantation from the main road, it appears to be in a thriving condition. Plants of 2 years' growth look particularly healthy. Mr. Owen Stroud has been in charge of this estate since Mr. Livingstone's departure on leave of absence, and the neat appearance of the estate shows what care is bestowed on it. There is a line of blue gum and Pride of India trees along the road, and another line of Mlanje cedars planted a little further back. With a good brick house, which is being erected this year, the plantation will be completed.

Mr. J. Boyd-Wallace has already planted 116 acres, and has about 100 acres cleared ready for planting next season. Mr. Wallace has laid out his estate with taste, and the roads passing through are lined with Pride of India trees. All the plants are only of 1 year's growth, so that 2 years must elapse before a return is obtained.

Mr. Gordon Mitchell's estate is being managed by Mr. J. R. Greenshields. He has about 70 acres under coffee: 100 acres of this is only first year, 70 acres second year, and 25 acres third year. This latter portion of 25 acres was originally planted with second nursery plants; and though this is but the second year since planting, tne crop, being really third year plants, is coming on and looks promising. Mr. Greenshields has also planted blue gums and Pride of India trees along the avenues on this estate, and along the main road. These are sufficiently well grown to afford shade. There is one rather noticeable feature in his estate in regard to shade: some of his young coffee plants were planted in the shade of a large *Ficus*, near the Namiwawa River, and, though the rest of the estate looks in a flourishing condition, the plants under the shade of the fig-tree are sickly and delicate.

The following are the other Namasi planters, with the approximate area under coffee:—Messrs. Robertson and Wren, 140 acres cleared and about 150 acres planted; Mr. K. Keiller, 100 acres planted; Mr. J. Cameron, about 30 acres planted; and Mr. P. Morkel, about 40 acres planted.

Another flourishing plantation along the Zomba-Blantyre road is that of Mr. S. Israel. He has about 60 acres third year, 70 acres second year, and 80 acres first year: about 210 in all. He does not intend to plant any more this year, but this does not tell against the rate at which he intends to extend his estate, because he has decided to transplant from his first-year nurseries into a second-year nursery, and this, while being much cheaper than actually putting in the seedlings where they are to remain in the fields, does not retard their growth; and next year, when these plants are finally set in the plantations, they are expected to be much stronger for the second transplanting, and a smaller proportion of blanks are obtained. The following is an extract from **Mr. Israel's notes on coffee:—**

The first step, of course, is to choose the site of your estate. I selected mine on account of the healthy appearance of the forest trees and rich growth of grass. When the forest is cleared, pegs are put in where the pits are to be dug. This is called 'pegging.' After pegging comes the pitting, then draining. In my case, I prefer to drain immediately after pegging, because the drains can be made better then. Thorough drainage is necessary, as the open drains prevent wash, and admit air into the soil. Then the ashes of the burnt trees and grass are carefully mixed with earth and put in the pits where the coffee plants are to to be set. It is not advisable to leave the ashes exposed, as the rain may wash them away, or the winds blow them about. Putting in the plants is a simple

matter, if well looked after. Pruning should be constantly kept up, and is even advisable in the second nursery. I have between thirty and forty men continually pruning. After the plants are 3 years old, before bearing, I make pits between the rows, one pit between every four trees, and into these pits I throw all the weeds, rotten leaves, and decaying vegetable matter as a substitute for manure. Then I cover up these pits, and, when the substances decompose, a valuable manure is obtained. I also 'thatch' my plantations in bearing—that is, cover the ground between the coffee trees with grass. After picking my crop I propose to manure the trees of one part of my plantation in the following way:—Dig a hole about 12 inches deep and about 1 foot distant round the stem in a half-circle, fill this with cow-dung, coffee-pulp, and ashes, well mixed with soil. Another part of my plantation I intend manuring with sulphate of ammonia and phosphates, of which, for an experiment, I have purchased six tons.

I have now commenced to plant shade trees, and have big nurseries of different kinds of Australian trees for this purpose; I shall not be able to tell for two or three years what effect the shade trees will have. Coffee estates might be advantageously laid out in gardens of from 5 to 10 acres each. When these are numbered and recorded, it is easy to make reference to certain plots, and to know what has been spent on them, when weeded, what is produced, and the working by task work is easier. In this manner my estate is laid out and worked. The following improvements will become necessary for a systematically worked plantation:—Large cattle stalls (built near the coffee gardens so as to save carriage of manure), brick houses for collecting ashes and manure, and good brick houses for the native labourers (to keep them in good health), good stores for drying coffee, for grain, and for general merchandise. Well-laid-out vats add to the value of a plantation. I have never a scarcity of labour. Labourers are constantly applying for work, and even in the wet season I am always well off. The fact of giving them good houses, giving them the option of food or merchandise to buy food with, weekly supplies of salt, and medicine when anyone is ailing, adds to a certain repute amongst natives. I notice that every tribe has its peculiarities and special fitness for certain kinds of work:—The Ajawa for skilled labour, such as sawing, pruning, bricklaying, carpentering; the Machinga, a section of Ajawa, are a strong set of men, and well suited for building, cutting trees, and similar work, where strong muscles are required. The Angoni cannot be beaten for pitmaking or careful weeding; and the Atonga, a strong and active race, can be made useful for all-round work. The Anguru are not well suited for garden work, but are excellent for tenga-tenga work—carrying loads up to 75 lb.

If, however, you happen to pity one of these men and pay him something extra for carrying a heavy load, he is never satisfied, whereas, if you take no notice, he makes no complaint whatever.

Mr. Israel has now been in the country 3 years, and says he has had practically no illness. He believes "a really active life" and moderate living to be the secret of health in British Central Africa.

Mr. Israel's crop just picked is close on 20 tons of parchment from 50 acres.

Around Blantyre, Mr. T. M. Hastings has an approximate area of 300 acres under coffee; Buchanan Brothers, at Chiradzulu, 80 acres; the late Mr. Horace Waller, at Naguafui, 50 acres; Buchanan Brothers, at Lunzu, 200 acres; Mr. Keiller, Matope, 60 acres; Kumtaja, 75 acres; Blantyre Mission, 10 acres; Sharrer and Co., a small plot at Blantyre of, say, 20 acres; Malotta, 20 acres; Pettitt Brothers, on their various plantations, more than 500 acres; Lloyd, 30 acres; Lamagna, 200 acres; Hunter, 100 acres; McLagan, 100 acres; Jonathan Duncan, 100 acres; J. Lindsay, 100 acres; African Lakes Co., Mandala, 10 acres; Bismarck, 10 acres; and David Livingstone, 10 acres.

Last year's coffee crop in British Central Africa reached nearly 500 tons (this was in January, 1897), the quality being excellent. Locusts are unfortunately very troublesome, and often destroy the blossom as soon as it opens. The question of carriage is a serious one to the African planter, and great difficulty is experienced in getting the crop to the coast.

COFFEE IN 1898.

The year just closed has been more remarkable for the cheapness and abundance of the commoner descriptions of coffee than for anything else connected with the trade; and there can be no doubt that, under these most favourable circumstances for carrying on the business, the dealers and others have been enabled to secure better profits out of their sales than have been netted for many seasons past. The primary cause of this descent from comparative scarcity and highly-inflated prices to the present conditions governing the article has been, as is well known, the great plethora of supplies from the Brazils, as foreseen years ago, when the 1897-98 coffee crops of Santos, Rio, &c., first began to be talked of as yielding about 10,000,000 bags. Few persons, at the time, could be brought to believe in so extraordinary a development in the production of one class of coffee; and those who confessed to having strong "bullish" predilections were loth to entertain the idea of such a possibility, knowing that, if realised, it must bring with it something bordering on a transformation of the whole of this branch of commercial enterprise. Yet we find that what seemed, at the outset, to be exaggerated statements and far-fetched expectations have been fulfilled to the letter; and that with an almost interminable glut of supply coming forward from a single source, within the 12 months dating from 1st July, 1897, to 30th June, 1898, there has been weighing on the European markets an excessiveness of stocks far surpassing in magnitude any that have ever before been warehoused in the various ports. These at the close of November last contained an aggregate of 223,000 tons, in striking contrast with 158,000 tons in 1897, about 88,000 tons in 1896, over 92,000 tons in 1895, and nearly 65,000 tons in 1894. It is not hazarding too bold an assertion to say that the bulk of the above 223,000 tons of coffee on hand was composed of inferior growths, which have always been more or less difficult to realise, and have consequently been the means of forcing prices down to amazingly low points, and of thus widening the gaps between quotations for the commonest and finest qualities. The great difference in the value of coffee, created so unexpectedly, has been the distinguishing feature of the year 1898, and has been preserved from the beginning to the end of the season. To emphasise the facts we state, it may not be out of place here to remark that, grouping the several kinds of coffee together, as if all came under the same denomination, the general range of prices, as latterly established for landed parcels, is as follows:—Low to good ordinary, including mixed sorts, at 25s. to 45s.; fine ordinary to low middling at 48s. to 64s.; middling greenish to fine middling at 66s. to 90s.; bright colour and bold at 96s. to 120s. per cwt. Within this list of quotations are to be found raw coffee beans of every variety of size, make, and colour, adapted to the wants and fancies of the most fastidious of home dealers and exporters; and, putting all the clearances together, it is fair to assume that larger quantities than formerly have been used and distributed over the Continent of Europe during the year now departed. The unusual disproportion between the extent of the assortment of the lower and the finer grades of unroasted coffee, which has existed throughout the season, has led to extremely stiff prices being paid for all desirable descriptions, which in the flattest of markets have met with ready purchasers at the highest rates of the day. From what may be judged to the contrary, there is no valid reason to look for any modifications of the wide distinctions in value above noticed, as coffee imported in the near future will probably continue to be characteristically the same as hitherto, so as to keep the selection as narrow as ever for the superior grades; and those who are anxious to lay in sufficient stocks of plantation and similar coffees must be prepared to do so promptly as soon as they arrive, and also be content to pay the maximum currency of the market. What are really wanted are liberal arrivals of useful medium sorts ranging from 65s. to 75s. per cwt. in their "green" state, which would be of immense service in helping the blenders to furnish consumers with a good wholesome beverage at a moderate figure, and at the same time ensure them a constant supply of this aromatic article without its patrons having to forsake it for some other form of non-alcoholic drink.—*Grocer.*

MANURE FOR COFFEE.

In Brazil the best soils are rich in phosphoric acid and potash, containing usually 18 to 35 per cent. of the former and 10 to 25 per cent. of the latter. To restore the amount of mineral matter annually removed by the crops, the added fertiliser contains about 8 grammes phosphoric acid, 35 grammes potash, and 16 grammes nitrogen per tree. Stable manure must also be added to the soil to get the best results.

Planting Opinion says:—The modern method of applying fertilisers tends to an increased production of coffee. Thus the products from fifty trees raised in the trial garden averaged per tree as follows:—

—	Planted.					
	1892.	1893.	1894.	1895.	1896.	1897.
	Gram.	Gram.	Gram.	Gram	Gram.	Gram.
Unfertilised	25	35	200	490	605	560
Fertilised	40	120	780	480	700	900

For well-fertilised trees 20 years old the products should average 2·5 kilos (about 5½ lb.) per tree.

MANURING OF TROPICAL PLANTS.—CORN.

Corn grows best on a soil that runs deep, is medium heavy and rich in humus; it also manages to get along on a light soil, although in that case it would require more liberal fertilisation, according to the condition of the soil.

Corn requires much larger quantities of plant-food ingredients than other cereals.

The following quantities of plant-food ingredients are removed from one acre:—

	Potash.	Phos. acid.	Nitrogen.
(*a*) By an average crop—			
of 2,230 lb. ear corn	8·3 lb.	12·7 lb.	35·7 lb.
„ 3,122 „ fodder	51·2 „	11·9 „	15·0 „
„ 1,070 „ cob	2·5 „	0·2 „	2·5 „
Total	62·0 lb.	24·8 lb.	53·2 lb.
(*b*) By a good crop—			
of 4,460 lb. ear corn	16·5 lb.	25·4 lb.	71·4 lb.
„ 5,798 „ fodder	95·1 „	22·0 „	27·8 „
„ 2,140 „ cob	4·9 „	0·5 „	4·9 „
Total	116,5 lb.	47,9 lb.	104,1 lb.

In comparison with other grains, corn removes considerably larger quantities of potash and nitrogen from the soil; it therefore requires a soil proportionally rich in both of these ingredients. Liberal fertilisation with stable manure produces a beneficial effect, especially upon soils deficient in humus. However, as stable manure can be put to a better use in the tropics and with more profit, artificial fertilisation, which will produce very favourable results against a small outlay, must be resorted to.

The following results of experiments upon corn, conducted at the Kentucky Experiment Station (at Lexington, Kentucky, U.S.), show plainly the effects of potash, phosphoric acid, and nitrogen :—

EXPERIMENTS with FERTILISERS on CORN at the KENTUCKY AGRICULTURAL EXPERIMENT STATION,* 1889.

No. of Plot.	Fertilisers applied per Acre.	Cost of Fertiliser per Acre.	Yield of Ear-Corn per Acre.	Yield of Straw per Acre.	Value of Corn per Acre.	Value of increased yield of Corn per Acre.	Profit or Loss after deducting cost of Fertilisers.
		dollars.	bushel of 70 lb.	lb.	dollars.	dollars.	dollars.
2 & 7	No fertilisers	...	34·5	2,540	12·08		
3	160 lb. nitrate of soda ... ... 320 ,, superphosphate ... ... 160 ,, sulphate of potash	11·20	79	3,920	27·65	15·57	+ 4·37
4	160 ,, sulphate of potash ... ... 320 ,, superphosphate	7·60	74	3,680	25·90	13·82	+ 6·22
5	160 ,, nitrate of soda ... ... 320 ,, superphosphate	7·60	34	2,420	11·90	— 0·18	— 7·78
6	160 ,, sulphate of potash ... ... 160 ,, nitrate of soda	7·20	81	3,620	28·35	16·27	+ 9·07
8	160 ,, sulphate of potash	3·60	80	4,100	28·00	15·92	+ 12·32
9	320 ,, superphosphate	4·00	33	2,160	11·55	— 0·53	— 4·53
10	160 ,, nitrate of soda	3·60	41	2,420	14·35	2·27	— 1·33

* Kentucky. Agricultural Experiment Station. Bulletin No. 26, 1890, page 10.

The use of potassic fertilisers produced the highest yields of ear-corn and straw, while the plots fertilised with nitrogen or phosphoric acid only, or with a combination of these two ingredients, yielded but little more than the unfertilised plots, at the same time proving a financial loss.

During the following years, the yields of ear-corn from the same field were in the same proportion, as can readily be seen from the following table* :—

No. of Plot.	Fertilisers applied per Acre.	Yield of Ear-Corn per Acre in Bushels of 70 lb.					Average of Five Crops.
		1889.	1890.	1891.	1892.	1893.	
2	No fertiliser	34·5	44	38	38	13	33·9
3	160 lb. nitrate of soda ... ... 320 ,, superphosphate ... ... 160 ,, sulphate of potash	79	72	56	61	35	60·6
4	160 ,, sulphate of potash ... ... 320 ,, superphosphate	74	65	51	51	30	54·2
5	160 ,, nitrate of soda ... ... 320 ,, superphosphate	34	33	43	29	15	30·8
6	160 ,, sulphate of potash ... ... 160 ,, superphosphate	81	76	60	62	35	62·8
8	160 ,, sulphate of potash	80	67	54	52	30	56·6
9	320 ,, superphosphate	33	36	38	25	13	29·0
10	160 ,, nitrate of soda	41	35	40	27	18	32·2

* Kentucky. Agricultural Experiment Station. Bulletin No. 55, p. 15.

Favourable results have also been obtained in Italy, as will be seen from the following experiments:—

RESULTS OF FERTILISING EXPERIMENTS UPON CORN, 1890.

By Professor Domenico Pecile, Udine.*

No. of Plot.	Fertilisers applied per Acre.	Yield per Acre. Ear-Corn.	Yield per Acre. Straw.	Increase over Fertilisation without Potash by means of— Sulphate of Potash. Ear-Corn.	Sulphate of Potash. Straw.	Muriate of Potash. Ear-Corn.	Muriate of Potash. Straw.
		lb.	lb.	lb.	lb.	lb.	lb.
	1. S. Osvaldo Udine (Royal Technical School):						
1	446 lb. bone superphosphate ... 330 ,, nitrate of soda	1,189	3,936				
2	446 ,, bone superphosphate ... 330 ,, nitrate of soda ... ... 125 ,, sulphate of potash	1,737	4,873	548	937		
3	446 ,, bone superphosphate ... 330 ,, nitrate of soda ... ... 120 ,, muriate of potash	1,728	5,239	...	...	539	1,302
	2. S. Giorgo della Richinvelda (Sen. Pecile):						
1	446 lb. bone superphosphate .. 330 ,, nitrate of soda	1,892	3,439				
2	446 ,, bone superphosphate ... 330 ,, nitrate of soda ... ... 125 ,, sulphate of potash	2,622	5,691	731	2,252		
3	446 ,, bone superphosphate ... 330 ,, nitrate of soda ... ... 120 ,, muriate of potash	2,441	5,724	...	...	549	2,286
	3. Palazzolo sallo Stella (Estate of Count L. Colloredo):						
1	446 lb. bone superphosphate ... 330 ,, nitrate of soda	1,392	2,691				
2	446 ,, bone superphosphate ... 330 ,, nitrate of soda ... ... 125 ,, sulphate of potash	1,646	2,524	254			
3	446 ,, bone superphosphate .. 330 ,, nitrate of soda ... ... 120 ,, muriate of potash	1,592	3,131	...	...	201	440

* From the Reports of the "Associazione agraria friulana."

The addition of potash considerably increased the yield in all three cases over that obtained from a combination of nitrogen and phosphoric acid. Sulphate of potash produced the greatest benefit upon the yield of ear-corn, muriate of potash upon that of straw. Even when the soil is naturally rich, the yield of corn will be increased by artificial fertilisation, as can be readily seen from the results of experiments conducted last year by Mr. L. W. West, of Hadley, Massachusetts.*

The soil was a heavy-loam, hard-pan bottom. No lime was applied, as this ingredient had produced no appreciable effect in previous years.

* From personal reports.

PLAN OF EXPERIMENT AND RESULTS.

No. of Plot.	Fertilisers per Acre.	Yield per Acre, 1895.	Increase over Unfertilised Plot.
1	No fertiliser	40 bus. corn ... 3,250 lb. straw ...	
2	1,230 lb. acid phosphate ... ... 400 ,, nitrate of soda	$59\frac{3}{7}$ bus. corn ... 5,260 lb. straw ...	$19\frac{3}{7}$ bus. corn 2,010 lb. straw
3	1,230 ,, acid phosphate ... ... 400 ,, nitrate of soda ... ... 240 ,, muriate of potash	$87\frac{1}{7}$ bus. corn ... 7,770 lb. straw ..	$47\frac{1}{7}$ bus. corn 4,520 lb. straw
4	1,230 ,, acid phosphate ... ... 400 ,, nitrate of soda ... ... 480 ,, muriate of potash	$91\frac{1}{7}$ bus. corn ... 8,850 lb. straw ...	$57\frac{1}{7}$ bus. corn 5,600 lb. straw

Potash was of great benefit in this experiment; the yield of car-corn was increased 118 per cent. and that of straw 140 per cent. over the unfertilised plot, and 47 per cent. and 48 per cent. respectively over the plot fertilised with nitrogen and phosphoric acid only. The double application of potash did not increase the yield correspondingly, so that 240 lb. of muriate of potash per acre seems to be the proper quantity to apply to corn on this soil.

The application of lime is of much importance for soils deficient in this ingredient.

The effect of lime upon light sandy soils is shown by an experiment made last year by Mr. L. W. Marsh, Washington, Pa , U.S.

FERTILISING EXPERIMENT ON CORN.

By L. W. Marsh, Washington, Pa., U.S.A.

No. of Plot.	Fertilisers per Acre.	Yields of Ear-Corn per Acre.	Increase over Unfertilised Plot.
		Bushels.	
1	No fertiliser	$49\frac{5}{6}$	
1a	2,000 lb. lime	$65\frac{1}{6}$	$15\frac{1}{3}$
2	615 ,, acid phosphate ... ... 200 ,, nitrate of soda	$76\frac{2}{3}$	$26\frac{5}{6}$
2a	615 ,, acid phosphate ... ... 200 ,, nitrate of soda ... ... 2,000 ,, lime	$80\frac{1}{2}$	$30\frac{2}{3}$
3	615 ,, acid phosphate ... ... 200 ,, nitrate of soda ... ... 120 ,, muriate of potash	$81\frac{1}{3}$	$34\frac{1}{2}$
3a	615 ,, acid phosphate ... . 200 ,, nitrate of soda ... ... 120 ,, muriate of potash ... ... 2,000 ,, lime	$81\frac{1}{3}$	$34\frac{1}{2}$
4	615 ,, acid phosphate ... . 200 ,, nitrate of soda ... ... 240 ,, muriate of potash...	$88\frac{1}{6}$	$38\frac{1}{3}$
4a	615 ,, acid phosphate ... ... 200 ,, nitrate of soda ... ... 240 ,, muriate of potash ... ... 2,000 ,, lime	$88\frac{1}{6}$	$38\frac{1}{3}$

Lime, when used alone, showed an increase of 31 per cent. on the yield of ear-corn; in combination with nitrogen and phosphoric acid, only 5 per cent.; while in combination with all three of the essential plant-food ingredients, it produced no increase whatever. Unfortunately, no record was kept of the yield of straw.

RAMIE CULTIVATION.

Again the question of ramie has come to the front, and some planters, both in the North and South of the colony, are asking for information. We refer inquirers to our articles on the subject in Vol. II., pp. 45 to 47, of the *Journal* for full particulars.

Meanwhile, it will be of interest to intending planters to read what Mr. J. M. MacDonald (of the firm of MacDonald, Boyle, and Co., London) said on the subject when in Ceylon to a representative of the *Colombo Tropical Agriculturist.*

On the point of production, it would be well to give the following absolutely authentic information:—

PRODUCTION.

In planting ramie, the cuttings should not be placed more than 18 inches apart. I advocate only 12 inches. The closer (in reason) that cuttings are placed the better for two reasons: (1) That no weeding would be necessary after the plants are 3 feet high; (2) the stems grow perfectly straight without lateral branches, which are very deleterious to the fibre. The first cutting can be taken in 3 months, but to be on the safe side we will say 6. Many experts have said that the first cutting from a plantation is useless, but here you see (showing a stick of Ramie) a 3 months' stick which has been produced from the estate of Mr. Thomas Gibson, the secretary of the United Planters' Association at Klang (Selangor). You see that the stem is 5 feet high; it is at least ½-inch in diameter, and with perfectly good and strong fibre, which you can find by taking hold of the fibre and pulling it. This stem is one of those produced from a cutting about 6 inches long, planted only 3 months before the stem was taken. The stool contained altogether fifty stems in vigorous growth, which no doubt in 6 weeks' time would have produced about a fifth of that number of mature stems. This plant is one of a number which Mr. Gibson had dug up and showed at a meeting of the United Planters' Association of the Federated Malay estates.

RAPIDITY OF PRODUCTION.

With regard to the rapid production in the Straits Settlements, we have the evidence of Mr. Gibson's plantation, where, as I have already stated, in 3 months' time there is a crop of stems ready to cut and plentful supply coming forward, a fifth of which in 6 weeks will be ready for harvesting. Now, instead of taking 3 months as the earliest cutting we will assume that it will take 6 months to produce three stems and not six. It becomes necessary to consider how many stems can be produced to the acre and what the weight of those stems would be. During the course of the experiments at Kuala Lumpur, in Selangor, carried on before a meeting of the United Planters' Association, a trial was made of a given number of stems taken haphazard from a heap lying there. It was found that the mean of fifteen stems, small and large shoots, weighed 4·8 oz. each, but for the purpose of our calculation we will say 4 oz. Taking, therefore, cuttings as having been put in at 18 inches apart, this would give eight to the square yard or 38,720 to the acre. Assuming that each plant only produces three stems each in 3 months, and calculating these at 4 oz. each, it is found that you can obtain 13 tons per acre, and inasmuch as the stems renew themselves every 6 weeks this will give an aggregate of 78 tons of stems per acre per annum. Bear in mind that this calculation only assumes a production of half the quantity actually produced from Mr. Gibson's estate.

Mr. MacDonald here handed to our representative a printed report of the proceedings of the United Planters' Association, which fully bore out his statement.

HOW RAMIE IS DEALT WITH.

We will notice now the reports of the "experts," when they speak of obtaining so many cuttings per annum, varying from two to four. The practice has hitherto been to mow down the whole plantation, hand over the stems to natives, when they are stripped by hand, and then the ribbons are dried and

packed into bales and sent away. A native has to produce a certain quantity of ribbons per day. It is perfectly immaterial to him whether he strips mature or immature stems, and the result is that in one bale of ribbons we obtain in some cases as many as twelve classes of fibre. I need not point out to you that this cropping system is a very objectionable one, inasmuch as stems from 6 inches to 2 feet high, which would be the large majority of the stems, are utterly destroyed and wasted. I therefore advocate the daily cutting system whereby only the mature stems are cut, and so arranging your planting that this may be effected daily, so that the coolie can go gradually through his 2 acres, and on his return to the starting point he will find the immature stems he left have ripened and are ready for harvesting. By this means it is obvious you more than treble the amount of your crop. I consider that each acre of land should produce 3 cwt. of stems per day. A coolie, therefore, from 2 acres of land, will have to cut 6 cwt. Taking the day at 10 hours, this means that he will have to cut about three stems a minute, and bale and deliver them every hour to the tram lines, when they would be picked up and delivered to the decorticators. Of course this is only possible in countries where the climate is equable throughout the year. The great advantage of this system ensures the quality of the fibre, and is a guarantee to the manufacturer that the quality will always remain the same.

DOES RAMIE EXHAUST THE SOIL?

A great deal has been said with regard to ramie as an exhauster of the soil. It has been thought, because it is possible to obtain more than 80 tons to the acre on good land under favourable conditions, that an enormous quantity of material must be taken away from the land, but it is entirely lost sight of that ramie contains 80 per cent of water, so that after all there is not so much taken out of the soil as would be imagined, and if the system be adopted of returning leaves and the refuse from the decorticators, in the shape of ashes, to the land, it follows that the fibre itself (only from 2½ to 3 per cent. of the crop) is actually taken from the soil.

THE AMERICAN EXPERIMENTS.

Experiments were carried out by the American Board of Agriculture in California to test the exhausting nature of ramie, and an acre was placed under cultivation, and the crops taken during 4 years. Nothing whatever in the shape of manure was applied to the land, not even the refuse from the stems, and it was found that the fourth year's crop was larger than the first. Of course this may be in consequence of the richness of the land, but at all events the fact remains.

Mr. MacDonald added that there is no fear of a market for the present, as one firm alone in Dundee had offered to enter into a contract to take 100 tons a month at £42 a ton, and inasmuch as the stuff can be grown, treated, baled, and imported into England with freights and all charges paid, including brokerage, at 1½d. per lb., this would leave a very handsome margin of profit to the grower.

SUGAR IN THE WEST INDIES.

WE take from the Report on the Economic Resources of the West Indies by Dr. Morris, C.M.G., &c., the following very interesting notes on the state of the sugar industry in those islands:—

BARBADOS.

Sugar has been grown in Barbados for the last 200 years. 74,000 acres are under cane. Some two millions sterling are invested in the industry.

The cultivation (says Dr. Morris) is carried on in a most careful and systematic manner. The soil is treated with artificial and other manures, and its capacity for yielding is still as good as that of any other country.

The total value of artificial manures employed reaches an average of £69,889 per annum. Canes are planted annually. The most remarkable feature in the manufacture of sugar in the island is that, of the 440 sugar estates, only 99 use steam power. The remaining 341 are dependent on wind power. On only four estates is rum produced at a cost of 3d. per gallon, exclusive of the value of the molasses used.

The net cost of producing a ton of Barbados sugar is £8 12s. 2d. As the current price of muscovado (raw) sugar in February last was £8 8s. per ton, the loss on every ton of sugar produced in Barbados was 4s. 2d. per ton.

Owing to the imperfect crushing of the canes in the present mills, and the somewhat crude methods of manufacturing the sugar, there is a considerable loss incurred on nearly all the estates in Barbados. According to careful estimates prepared by the Analytical Chemist and the Superintendent of the Botanical Station, and based on experiments extending over seven years, it is stated that there is "an average loss of over 2,000 lb. of sugar per acre left in the canes after crushing, which is left in the mégass." They add:—"A large part of this could have been recovered by more perfect crushing." "This," says Dr. Morris, "may be expressed in another way. In consequence of imperfect extraction, it now requires 13·6 tons of cane to produce 1 ton of sugar." The manufacture, according to Professor D'Albuquerque, is equally defective. He states:—"For every 100 lb. sucrose (crystallisable sugar) contained in the juice, not more than an average of 75 lb. of ordinary muscovado sugar is recovered." There is, therefore, a loss, owing to imperfect manufacture, of 25 tons of sugar in every 100 tons contained in the juice extracted. The yield of canes in Barbados in fairly favourable seasons may be estimated at 25 tons, and the gain per acre by the adoption of the central-factory system at the present range of prices would amount to £6 5s. According to this statement, if only one-half of the area of existing estates were to adopt the central-factory system, the total increased value of the sugar produced would amount to nearly a quarter of a million sterling.

[From this it will be easily seen what great losses the early Queensland sugar-planters sustained by working with horse-mills, low-powered steam-mills, and with open batteries, finishing up by striking from the tâche.—Ed. *Q.A.J.*]

TRINIDAD

Of 90 estates in Trinidad only 26 produce vacuum-pan sugar, but the appliances for sugar manufacture are pincipally of a modern type. The superior class of labourers take up the cultivation of cane on their own or on hired land, and sell the canes to the mill-owner at a fixed sum per ton. The price at present is 9s. per ton.

TOBAGO.

Of some 38 sugar estates now existing, not one-half employ steam power. Here the cultivation is carried on solely on the metayer system; the owner of the estate supplying the land on which the cane is grown, carts, stock, and the necessary machinery. The metayer supplies the labour and grows the cane. The sugar made is divided into halves—one for the metayer, one for the estate owner. There is presumably a great loss of available sugar. The sugar-mills are all small, and only common muscovado sugar is made.

One proprietor has already started cane farming with 60 farmers, who have agreed to sell their canes at 4s. per ton, the estate undertaking the carting to the mill.

The Commissioner (the Hon. W. Low) stated that "a factory would pay, even if foreign bounties were maintained."

The cost of producing a hogshead of sugar (2,000 lb.) under the metayer system is £7, equal to £7 16s. 9d. per ton.

GRENADA.

The area under sugar here is placed at about 1,000 acres, and the sugar works are kept up chiefly for the distillation of rum. The island does not produce sufficient sugar for its own consumption.

ST. LUCIA.

There are several large estates here where the machinery is all of modern construction. The St. Lucia Mines and Estates Company, Limited, own or lease 13 estates, with a total area of 5,925 acres (2,086 acres in canes). The Dennery factory has a total of 560 acres in canes. The Central factory has a total area of 2,000 acres, with 550 acres planted in cane. Besides these, there are about 70 small areas owned by peasant proprietors, who sell to the neighbouring factories. Hardly any open-pan sugar is made in the island.

ST. VINCENT.

The position of the sugar industry in St. Vincent has been in a gradually decaying condition during the last fifteen years. Probably there are some 60 estates working. The largest proprietor owns 21 estates, having a total area of 11,826 acres.

The area under canes now is only 1,201 acres.

Cane diseases, both borer and fungus, have also been more prevalent in St. Vincent than in any other part of the West Indies. Professor Harrison describes the manufacture "as in a most deplorably backward state." He points out that "the crushing power of the water-mills (almost universally used) is very deficient . . . . in the boiling-house, little care seems to be taken with the classification of the juice, and the sugar produced is of low quality." All the sugar is open-pan or muscovado sugar. The total value of the produce under the present system is estimated at £20,400, whilst with a central factory it would probably be £29,650.

In Dominica only 975 acres are under cane. Rum is distilled on five properties. Most of the large estates belong to absentee proprietors, and both the cultivation of the cane and the manufacture of its products are carried on in a primitive and wasteful manner. Only common muscovado sugar is made, and the largest properties do not turn out on an average more than 200 hogsheads (about 178 tons).

The same story is told of the sugar industry at Montserrat and Antigua. In the latter island over 13 tons of cane are required to make a ton of sugar, and from 60 to 70 gallons of molasses are yielded for each ton. The methods of manufacture have undergone little change for the past 200 years.

On St. Kitts and Nevis the cost of producing a ton of raw sugar is stated to average £9 9s. 4¾d.

The mean expression of the sugar-mills is 60 per cent. of juice from the weight of cane, and the return of sugar 6·32 per cent. If the molasses were reboiled, a return of about 7·25 per cent. of sugar would be obtained. In the former case it will be seen that it would require 16 tons of cane to produce 1 ton of sugar, and in the latter 13·79 tons.

Molasses is only worth 5 cents per gallon, and cannot be disposed of even at that price.

JAMAICA.

The area under cultivation in sugar-cane is 30,036 acres. The amount of capital invested in the industry is stated to be £1,167,000.

The largest estate is not over 500 acres.

Steam power is employed on 95 estates, water power on 38, water and steam on 3, and cattle on 4.

Only 2 estates employ a vacuum pan and a triple effet. Rum is distilled on 138 out of 140 estates. The rum crop, of late years, has been often more valuable than the sugar crop. There is usually produced a cask of rum (100 gallons) for every ton of sugar. The average cost of producing 1 ton of sugar and 100 gallons of rum is £20.

For sugar alone the cost has been from £6 to £7 7s. The majority of the estates are small, the average area under cane being only 178 acres. The annual production of rum is a little over 2,000,000 gallons.

There are 6,000 small mills, probably cattle mills, owned by the peasantry. Cane farming as carried on in Trinidad does not appear to have been tried on any appreciable scale in Jamaica.

BRITISH GUIANA.

The area under sugar in this colony is given as 66,908 acres, divided amongst 64 proprietors. The amount of capital invested is £10,000,000, and the export of sugar in 1895-96 was 101,160 tons, of the value of £1,046,160. The average yield per acre only reaches 1·5 tons of sugar. Sugar is the staple production of British Guiana, and it is carried on with considerable energy and intelligence. At one time, the cost of production was £16 1s. 7d. per ton. Now the cost has fallen to £9 10s.

All the mills are of modern style and fitted with double and triple crushing machinery with or without maceration, and in two factories the diffusion process is employed. As much as 90 per cent. of juice is extracted by triple crushing (with 10 per cent. dilution), and from this is recovered 84 to 88 per cent. of marketable sugar, polarising on the average about 95 degrees. The average return of sugar obtainable all over the colony is placed by Professor Harrison at about 9 per cent. of the weight of cane.

Animal Pathology.

TEXAS FEVER PROBLEMS.

In this number of the *Journal* we conclude the very interesting articles on Texas Fever by Dr. E. Salmon, D.V.M., Department of Agriculture, Washington (U.S.A.).

Mr. P. R. Gordon, Chief Inspector of Stock, Queensland, writing on the subject of these articles, considers that their publication will be productive of much good, "if only to show our cattle-owners that our investigations are on the right track."

Referring to dipping, he says:—

"When cattle can be put into railway trucks and sent away immediately after dipping, there would be no risk in thus permitting dipped ticked cattle to travel to clean country (assuming an effective dip to have been discovered), but it would be impossible to truck cattle immediately from the dip here. I still think, however, that dipping will ultimately play an important part in mitigating the pest, and, therefore, all information collected on the subject should be given publicity to."

TEXAS FEVER PROBLEMS.—IV.

It has been shown in previous articles that the problem as to how cattle from the infected district may be moved to other sections of the country without endangering the stock of the localities to which they are taken is solved by a method of dipping the infectious cattle which kills all of the ticks on them. The progress made in perfecting this method has been briefly outlined. The second problem, or how to take cattle from the non-infected parts of the country into the infected district without subjecting them to the great danger of contracting the disease and dying from it, is of an entirely different

nature. In the first case it was necessary to devise a plan by which cattle capable of resisting the disease, but which carried the contagion constantly in their blood, could be prevented from communicating this contagion; in the second case it is necessary to save the lives of susceptible animals which must be taken where they will be constantly exposed to the contagion.

Practical experience demonstrated many years ago that young calves are much less susceptible to Texas fever than mature animals, and that there was a minimum loss among such animals if they were taken into the infected district in the fall of winter. In the light of our present knowledge these facts mean that calves contract this disease, but suffer much less from it than do grown animals; that they contract the disease during the late fall, winter, or early spring in the infected district, and have a milder form of the disease then than in summer; and finally, that after recovering from this mild form of the disease the contagion does not as a rule affect their health. That is, in taking calves to the infected district in cold weather we have a method of producing immunity from the fever. Unfortunately this method is uncertain in its results and attended with heavy losses. The calves might be infected at the proper time or not until too late in spring; they might get a proper dose of the contagion, or they might be too heavily infected.

Soon after the nature of the contagion and the part played by the ticks in carrying it were discovered by the Bureau of Animal Industry, experiments were made from which it was concluded that northern cattle might be given a mild attack of the disease in a number of ways. A field might be infected by scattering ripe, egg-laying ticks upon it at the proper time in the fall and afterwards turning the cattle upon this field. By this method the time of the infection could be regulated, but not the extent of the infection. In order to control the infection more accurately, tick-eggs were collected and hatched by keeping them in a moderately-warm place and then placing a given number of young ticks upon the animals. Another method of infecting animals, shown at the same time to be efficacious, is to inject blood from an infected animal into the veins or beneath the skin of the cattle to which the mild disease is to be given. It is evident that, for this purpose, there may be used either the blood of an immune animal from the infected district, of a sick native, or of a native which has been sick and recovered. By native is meant any suspectible animal raised in the non-infected district.

The first systematic experiment by the bureau for the purpose of immunising cattle was make in 1895. Eleven young animals were selected for this purpose, of which three were 3 months, one was 4 months, three were 5 months, two were 5½ months, and two were 15 months old. They were inoculated by injecting under the skin 10 cubic centremeters, or about 2½ drams, of the blood of cattle from the infected district. The operation was performed upon three in February, one in September, and seven in October. All but one of these suffered more or less from mild Texas fever. One was but slightly affected, showing scarcely any symptons except a diminution of the red corpuscles from 8,377,000 in a cubic millimeter of blood to 4,270,000, or about one-half the normal. The remaining nine were more severely affected, showing high temperatures ranging from 103·2 degrees to 106·5 degrees Fahr., unthriftiness, and emaciation.

The great decrease in the number of red globules in a cubic millimeter of blood is interesting, and indicated in a general way the seriousness of the inoculation disease. In one the number fell from 8,297,000 to 3,640,000; in another from 8,900,000 to 2,195,000; in another from 5,470,000 to 1,502,000. It was from 6 to 10 weeks with the greater part before they recovered from the effects of the inoculation, though none appeared at any time to be in a dangerous condition.

The following spring, nine of these inoculated young cattle, together with four animals which had been exposed to the disease and recovered after being slightly affected, and five which had never been exposed, were shipped to the infected section of Virginia and there exposed during the summer.

The result of this exposure was that four of the five cattle which had never before been exposed, and which were not protected by inoculation, died during June and July. The fifth had a very severe attack and barely escaped death. These five animals were used as checks to prove that the inoculated animals were exposed to a virulent infection. The four animals which had previously been exposed all contracted the disease, but none died. Three were very severely affected, and one had a rather mild attack. The nine inoculated animals fared very much better. None of these animals died. Five showed no symptoms of disease, and the remaining four were affected in a very mild form. These animals were again exposed the following summer (1897), after which they were sold in good condition.

This has been the most conclusive experiment that has been made in this country, if not in the world, to demonstrate the value of protective inoculation. Unfortunately other pressing duties have prevented this line of investigation being followed up and fully worked out. While this one experiment would seem to indicate that inoculation may be easily and safely performed, and that it protects satisfactorily, there might be exceptions in practice. The breed of the animal has considerable influence in determining the seriousness of the attack. Valueless scrubs probably resist best, while beef breeds would be in most danger. What is true of young cattle may not be true of older ones.

There may also be a difference in the virulence of the contagion from different sources. The people in some parts of the infected district claim that while their cattle resist the native infection they are killed by exposure to cattle which come from some other parts of that district. Again, the Australians, who are now inoculating quite largely, think that the blood from an animal which has only recently recovered from an attack of the fever produces milder disease when used for inoculation than does that of an immune animal from the infected district or that of a native which has been sick and recovered a long time before the blood is used.

These are all points which need to be worked out experimentally before inoculation can be practised with safety on valuable cattle purchased for breeding purposes. The method is apparently entirely feasible if confined to calves or yearlings, and possibly it may also be used with almost equally favourable results with mature cattle. In the latter case, however, there is more doubt, and anyone trying such inoculations should proceed cautiously.

The writer is quite confident that within a very few years nearly all pure-bred cattle taken to the Southern States to improve the stock will first be inoculated to preserve them from the dangers of Texas fever.

TEXAS FEVER PROBLEMS.—V.

Although the dipping of cattle from the infected district will remove the danger of contagion from them, and although the inoculation of young animals destined for the infected district will prevent them from the fatal effects of contagion, the stockmen of the greater part of that district have something more to look forward to, and may indulge the hope that with time and proper efforts their section may be entirely relieved of the infection. People now living have seen the infection extend itself for many miles, and the probability is that little, if any, of our territory contained the contagion at the time the continent was first settled by Europeans.

We have seen that two parasites are necessary for the production of Texas fever under natural conditions. As the tick has been able to accustom itself to greater cold, it has gradually extended its habitat to higher latitudes and greater altitudes, and in doing so has carried with it the microscopic protozoa which constitute the contagion.

The fact that the fever tick and the protozoa infest South American cattle, and that they exist over a wide extent of the African continent and also in Australia, would seem to indicate that both parasites had originally been brought to America with the settlers' cattle. It now remains to determine whether the protozoa of this disease exist anywhere and multiply otherwise than

within the ticks and in the blood of cattle. If these minute organisms are absolutely dependent upon the ticks for their existence, we would destroy them by eradicating the ticks; but if the protozoa may live an independent life in the more or less stagnant waters or marshes of the South Atlantic and Gulf Coasts it would be hopeless to attempt to annihilate them entirely.

Without the ticks, however, the protozoa would be of simply local interest. Even if the native cattle became infected by drinking contaminated water they could not spread the disease, and no cattle would suffer except those raised in or taken into the comparatively small area in which these special conditions of high temperature and slow-running or stagnant water exist. We may admit, therefore, provisionally at least, that the destruction and extirpation of the fever tick means the eradication of the Texas fever contagion in the greater part, if not all, of the territory of our Southern States.

In at least half a dozen counties in Virginia where the fence laws prohibit the running at large of cattle the ticks have soon disappeared, and these counties have been placed above the quarantine line without any loss having since occurred through contagion spread by the cattle from those sections. From a number of farms, and particularly the farm of the Georgia Experiment Station, the ticks have been eradicated by picking them off the cattle by hand and destroying them as fast as they became large enough to see. Two years have been sufficient to accomplish this result. Now the interesting fact has been demonstrated that northern cattle taken to such farms no longer contract Texas fever. This strengthens our theory that in much of the southern territory at least the protozoa are not obtained by the cattle from the soils or waters, but that they must be inoculated by the ticks.

Accepting this theory then as demonstrated for some parts of the infected district and as probable for the greater part of it, and we are led to ask, What is the least expensive and most feasible method of eradicating the ticks? The first step is undoubtedly to prevent cattle from running at large and continually gathering up and bringing in a fresh supply of these parasites. The home cattle must be kept at home, and no other cattle should be allowed to come upon the premises. The second step is to prevent any ticks from maturing upon the cattle.

It appears that the ticks must pass a considerable part of their life upon cattle in order to perpetuate their species. Young ticks hatched in the spring may live upon pastures during the whole summer, but they remain very small, are unable to multiply, and die upon the approach of winter. In just what form the tick survives through the winter is not definitely known to the writer. As these parasites are observed to remain on cattle for a long time in cold weather, it is probable that some of them pass the most dangerous period protected by the hair and supplied with warmth from the animal's body. Either the live ticks or their eggs, it is uncertain which, may also survive the winters as far north as the quarantine line when protected by leaves and brush. But if they do not meet with cattle and mature upon them the following summer they all perish.

The possibility of these ticks maturing upon other species of animals is a question of considerable importance in this connection, but unfortunately cannot be completely and satisfactorily answered. The Texas-fever tick is a cattle tick, and does not readily grow upon other animals. It is often found upon horses and mules, however, but the fact that Texas-fever outbreaks have seldom if ever been traced to contagion carried by these animals seems to indicate either that the ticks raised upon them are not fertile and fail to reproduce themselves, or that because the equine species does not harbour the microscopic protozoa the young ticks from mothers raised upon horses and mules do not bear the contagion. These points should receive close investigation. In the meantime it may be assumed that the ticks may be eradicated from pastures or farms by preventing any of them from maturing for 1 year, or at the most 2 years, upon bovine animals.

The most successful way of destroying the ticks upon cattle is to pick them off by hand and burn them. This, of course, can only be done with a few animals upon any one farm, and these animals must be such as can be easily handled. The picking must be repeated every day or two during the summer, and must be thorough to be successful. This is not as difficult or tedious a method as might at first thought appear. Where picking is impracticable, substances may be applied to kill the ticks. For this purpose the simple oils and fats are useful if repeated with a few days' interval. Crude cotton-seed oil or lard either alone or, what is much better, mixed with flowers of sulphur, will destroy most of the ticks, and if repeated often enough will probably prevent any from coming to maturity. The petroleum oil with sulphur, such as has been used for dipping cattle, is more efficacious, but is difficult to obtain in small quantities and of uniform quality. Probably within the next year Secretary Wilson will be able to arrange with one or more of the oil companies to supply a thoroughly tested, safe, and efficient mixture for this purpose. This cannot be done, however, until further investigations are made.

Another plan which would probably be successful in eradicating these ticks is to keep all cattle from the pastures for 1 or 2 years. The exclusion of the cattle must be absolute, however, for a single animal walking across the grounds might drop enough mature ticks to continue the infection for another year. In restocking grounds cleared of ticks great care should be observed to allow only cattle free of ticks to go upon them. There can be no certainty in such cases except by dipping the cattle in an approved tick-killing mixture, and consequently a successful dipping method would also for this purpose be invaluable.

It must be evident that dipping the cattle going out of the infected district and inoculating those going in are only temporising expedients through which no improvement in present conditions relating to the infection can be expected. While of great importance, these measures should not be considered the end of our resources or the limit of our hope. States situated as are Virginia, Tennessee, Arkansas, and Oklahoma Territory should move at once to annihilate utterly the tick and thus secure a position in the non-infected district of the country. The improved condition of the cattle as a result of freedom from the irritation of these pests, and from the loss of the blood which they abstract, would well repay the inhabitants of those States for the required effort, and the free market for their cattle would be clear gain. All of the remaining States in the infected district should make a systematic effort to reduce greatly the extent of territory afflicted with this contagion and to confine it to comparatively insignificant areas.

This is a matter which will require time and careful education of the people. But the education should begin now and be continued without intermission. The extension of the infected district, which was progressing at an alarming rate previous to the enforcement of regulations for the movement of infected cattle, has been checked, and in some cases whole counties once infected have been freed from the infection. It is the part of wisdom to continue this good work and to press back the infection all along the quarantine line. This is one of the great tasks which our country has before it—a task of special importance to our farmers north as well as south, and one which is so pressing that it should be considered by the Nation as of equal importance with the encouragement of our manufactures and the extension of our foreign trade. Fortunately, Congress has always been willing to aid such work, but a point has now been reached where the States individually must also take it up.

In the article on dipping cattle (Texas Fever Problems.—III., *Q.A.J.*, Vol. 4, Part III., p. 227) it was erroneously stated that the total loss among the first lot of dipped cattle shipped to Illinois was thirty-two head; there were, in fact, only twenty-four head lost out of this shipment.

Forestry.

FOREST CONSERVATION.

BY A. J. BOYD.

THE subject of the preservation of our timber supplies has been brought under the notice of the rural public for many years, yet the destruction of many valuable timber trees is carried on daily, without the slightest individual or co-operative attempt to supply the drain. Why should people always look to the State to do this work for them? When a settler begins to plant an orchard, he does not ask the Government to supply him with trees at the public expense; he purchases his own trees, plants them at his own expense, and spends his private means on carefully tending them until they finally begin to repay him for his outlay. If a tree dies or becomes weak from too heavy bearing, he roots it out. Does he leave a blank in the orchard? He knows better than that. He at once plants another in its place, which in due time will repay the care bestowed upon it. As other trees fail or die from various causes, the gaps are regularly filled up, and so the orchard goes on year after year with no diminution either in numbers or in yield.

Is it so with our forest and scrub trees? When cedars, beeches, and pine trees are cut down, does the timber-getter, even if he be the owner of the land, ever think of planting others in their places? Never. Then comes the question, "Why not?"

Perhaps the answer of one man may serve for that of all owners of heavily timbered land.

That man was in treaty only last month for the purchase of a large property not 50 miles from Brisbane, and one inducement held out to him was that the timber on the land was worth at least £500.

"Oh! bother the timber," was his reply, "I want it cleared off to grow stuff for the stock." *E uno disce omnes.* So says the Latin writer, and it is equally true of our planters, farmers, and selectors. The case of one is the case of all. Get rid of the timber. There is enough to last their day; and as for posterity, well, let posterity look after its own timber supplies. What many fail to understand is, that a well-managed timber estate is worth more than a poorly managed farm or orchard.

For the sake of comparison, let us take a rich rubber-tree forest, such as are to be found in Brazil, in Central America, and other countries of the world. The old trees are there. They are constantly reproducing themselves. When the old trees die or are killed off by excessive tapping, there are constant supplies of young trees coming on, hence the supply of rubber is practically inexhaustible. No man would be insane enough to clear off the rubber-tree producing jungles for the purpose of growing corn for cow feed.

A fifteen-year old *Hevea Braziliensis* will yield nearly 25 lb. of rubber per annum, valued at 3s. 6d. per lb. An acre containing 100 of these trees is therefore worth £437 10s. All the time during which the old trees are being tapped, the younger trees are coming on, and are ready to take the place of those that are worn out or dead.

An acre of land planted with citrus fruits contains, say, 100 trees. The gross annual value of the produce of these trees may be averaged at £100, some producing as much as £5, others only 5s. From this has to be deducted the cost of cultivation, pruning, dressing, spraying, fumigating, picking, packing in cases, &c.—expenses which vary with the soil, climate, locality, proximity to market, &c.

Now take the case of bananas, which produce more food matter than any known product of the soil, acre for acre. It is estimated that 100 acres of good land established in bananas will yield during the second and subsequent years after planting about 1,000 bunches per week. Each bunch will contain, according to the variety, from seven to ten hands—a hand consisting of from ten to seventeen bananas; each bunch would thus be worth about from 9d. to 1s. 2d., bringing the yield of an acre up to over 9s. per week, or over £23 per acre per annum. Jamaica bananas sell in the London market at from 12s. to 15s. 6d. per bunch, whilst at Glasgow some were sold as high as 14s. to 16s. per bunch.

We have now compared three crops—rubber, citrus fruits, and bananas. The first requires no cultivation; the second stands in need of constant care and attention, involving considerable expense from the very outset. The third can pretty well look after itself, once the stools are established.

What I more particularly want to point out is the pressing need for caring for the perpetuation of forest and scrub trees, hard and soft.

In all our yet standing scrubs, the timbergetter is busy removing the various commercial timbers peculiar to the scrubs, amongst which the principal are kauri pine, hoop pine, cedar, beech, crows' ash, and silky oak. When these are gone, then, according to popular opinion, nothing is left of any commercial value, and the scrub is only fit to be cut down and burnt off. But there are still many timber trees in the coast scrubs especially which will yet be of great commercial value for the purpose of furniture-making, veneering, &c. Such are the yellow-woods, rosewood, tulip-wood, brigalow, satin-wood, and many others, all of which are capable of taking a high polish, and of making excellent veneers, and these should be preserved as much as those in more immediate demand.

This does not imply that no scrub should be cleared, or that the more valuable timbers should not be brought to market. Timber we must have, and forests were intended by Providence to be cut down for the use of man, and for other purposes besides, such as attracting rain, preserving the land from being dried up by exposure to the scorching rays of the sun, and protecting the soil from being washed down into the watercourses. But what is required is the protection and nursing of the young trees which, in the ordinary course of nature, would eventually take the place of those removed.

Planting young trees is not so much a necessity as the nurture of those growing naturally. To this end all that is needed is for the timber on our lands already reserved by the Government for forest areas, to be carefully tended.

In France the work of restoring the forest is being systematically carried on, and in mountainous country, ages since denuded of timber, the course of torrents is stopped or deflected by means of stonework and fascines made of live willow. These fascines readily strike root, and form a barrier behind which the *débris* from the high lands accumulate, and so by degrees the wasting of the surface is arrested and forest planting begins. It must be borne in mind that the re-afforestation of a denuded hillside, cut into deep chasms by the descending torrents, extends its influence to the plains below, often for hundreds of miles.

The silt washed down from the bare hills is carried on to the low lands, and instances can be multiplied in every country of the world, where civilised man has planted his foot, of tens of thousands of acres of rich alluvial plains being overwhelmed with barren gravel, sour mud, and other silt. Witness the ruin of many farms in Southern Queensland after the great flood of 1893. Not only were many acres completely washed away, but entire farms were for miles covered with a sour deposit several inches thick, which rendered the land utterly unfertile, and caused the owners to abandon them in despair.

In Germany the forests are so skilfully managed that 11,000,000 acres of State forests produce an annual income of £4,000,000. And this result is arrived at, not so much by planting as by intelligent work in regenerating the forests. The German forester works on opposite lines to those of the lumberer.

He arrives at his happy result by a process of natural selection—he gets rid of the least valuable timber in various ways, and causes the survival of the fittest by judicious culling. The lumberer destroys the fittest and leaves the most useless to cumber the ground.

The Khanate Bucharia was once upon a time the most flourishing and fertile region of Central Asia. It was well timbered and well watered. What has happened to this earthly paradise is happening now in our midst. A mania for clearing seized the inhabitants within the last thirty years. All the great forests have been destroyed, and what was spared was swept out of existence by fire during the civil war. Now mark the consequence. With the disappearance of the forests, the watercourses gradully dried up; there was no water left to feed the empty irrigation canals. The great barrier against the desert sands was removed, and irresistibly they advanced upon and gained daily on the fertile plains; and it is now only a question of a short time when this magnificent region will become a desert as desolate as the solitudes that separate it from Khiva.

Dr. D. Morris, C.M.G., M.A., &c., &c., in his report on the "Economic Resources of the West Indies," in alluding to the forests of British Guiana, says:—The total export of timber is £16,000 per annum. The forest lands yield a yearly revenue of about £48,000, made up of "acre money," royalty on timber shingles, charcoal, balata (the milky juice of the bullet-tree (*Mimusops globosa*), a kind of guttapercha), and gums. These forests, rightly controlled, should constitute an important source of wealth to the colony. Owing to the difficulty of reaching the region above the falls [presumably of the Essequibo River—A.J.B.], the forests below have been cut over several times and the best timber removed. In some localities firewood-cutters and charcoal-burners are destroying valuable timber and preventing the growth of young saplings.

The time has arrived when the Government might take in hand an investigation of its forest resources, and employ a competent officer from India or elsewhere to advise as to the best means of regulating and developing them. The Guiana forests are the most valuable of any in the West Indian colonies. Hitherto they have only been partially protected, and it is evident that they are in danger—at least, in the most accessible districts—of being seriously injured. The vast regions above the falls are safe only from their inaccessibility. If suitable means of reaching them could be devised, and the cutting carried on under proper regulations, they would be capable of supplying valuable timber and contribute largely to the wealth of the colony. The most valuable timber is the "greenheart," known also as the "bibiru" (*Nectandra Rodiæi*). This tree (one of the laurels) is widely distributed on rocky soils along the banks of the Essequibo, Mazaruni, and Cuyuni Rivers, but not extending more than about 100 miles inland from the coast The bark yields a valuable tonic medicine—biberia. The timber is very hard and durable, and is specially valuable in the construction of canals, wharves, dock-gates, and in shipbuilding. It withstands the attacks of the teredo, and lasts longer than any other timber under water.

According to Mr. McTurk, greenheart in British Guiana has been practically exhausted in the area below the falls, "but, above, there are millions of cubic feet that have never been touched by the axe." These are protected to the extent that those squaring less than 12 inches are not now allowed to be cut. The indiscriminate cutting of wood for charcoal-making is regarded as very injurious to the forests of the colony.

In Grenada, attention has been called to the serious effect of deforestation. The best timbers are everywhere being destroyed to convert into charcoal.

With all the knowledge we possess on the subject of forest conservancy, we still persist in the suicidal policy of extermination. Whence shall we obtain our supplies of the marvellously durable timber of the *Eucalypti*, once we have swept them from the face of the land? How many generations will

come and go before such magnificent trees as we have seen even in the close neighbourhood of Brisbane can be reproduced? To depend on foreign countries for our supplies is to depend upon a broken reed. The vast forests of North America, Canada, Oregon, British Columbia, and Vancouver are being destroyed wholesale. There is nothing to take their place. The great forests of South America cannot furnish us with our requirements. But we have the means in our own hands of keeping up our supplies for all time, and it is the duty of every citizen of the State to help in the work, and to do so before irreparable damage has been done.

A Parliamentary return in connection with the Woods and Forests Department of South Australia shows that for twenty years, ending 30th June, 1896, the expenditure on natural forest management was £14,626 7s. 8d.; on establishing plantations, £55,451 19s. 5d.; on rearing and distributing trees gratis, £26,101 5s.; in experimental and ornamental planting, £9,160 7s. 11d.; total, £135,340. The revenue derived from natural forest management—rents and sales of timber, £117,904; from plantation timber, £1,000; valuation of existing plantations (6,751 acres), £120,000; value of 4,000,000 trees given away at 2d. per tree (exclusive of vines), £33,000. The balance in favour of the department is £136,564.

General Notes.

ORANGE SCALE.

Mr. A. H. Benson, in response to inquiries by "Orange Grower," supplies the following information:—

Citrus trees, when making a vigorous and strong growth, are sometimes able to throw off scale insects, but this only takes place when the roots of the trees are thoroughly healthy and the trees are planted in a soil that has a perfect natural drainage.

In the case of "Orange Grower's" trees, it is probable that the subsoil is more or less retentive, even though it is scrub land and on the side of a ridge. Continuous and heavy rain would be likely to injure citrus trees in such soil and induce the propagation of scale insects, especially White Scale. All citrus trees are prone to become scale-infested when grown under conditions that are at all conducive to the retention of stagnant water round the roots of the trees.

We would suggest to those who wish for instruction and assistance in the important work of fruit-growing to communicate directly with Mr. Benson or with the Under Secretary for Agriculture, and also that they give their names, and full particulars of the locality of their orchards or gardens, such as district, aspect, soil, subsoil, rainfall, &c. It is difficult for the most expert professional to give precise directions for manipulating fruit trees, unless precise information such as we have indicated is furnished.

THISTLES *V.* RAPE.

A correspondent of an English paper says that he has discovered that if you have a field infested with thistles, all you have to do is to sow it with rape. The thistles will be absolutely annihilated.

TOMATO SAUCE.

TOMATOES are found growing either cultivated or self-sown on most farms in Queensland. The finest tomatoes we ever saw we found growing on a deserted goldfield in the Gilbert district; yet amongst the heaps of bottles lying about the abandoned huts, there were to be seen some labelled "Tomato Sauce," made in England! This with splendid fruit at the very doors of the miners. Why do farmers buy imported tomato sauce? Is it to save trouble? The making of this excellent condiment is so simple that only five ingredients are required in addition to the fruit. Here is a good *Rural World* recipe:—Peel some ripe tomatoes, say ½-gallon, and take three pods of red pepper (chilies) and cook till tender. Strain this through a coarse cloth, or pass it through a hair sieve, and add 1 oz. of salt, 1 oz. of black pepper, ¼-oz. of allspice, and ½-pint of vinegar. Boil the whole slowly for 3 or 4 hours, bottle it whilst warm, and cork it down tightly.

A FEW HOUSEHOLD HINTS.

IF you wish for good digestion, eat onions, tomatoes, olives, and apples.

JUGGED HARE.

The hare season is coming on, and city folk will be looking for presents of these animals from their friends on the Downs. Many people dislike hare, but often this dislike is brought about by the ignorance of the cook. Now few things are nicer in the way of prepared game than jugged hare, but few cooks really know any better than the "good plain cook" who thought that jugged hare meant hare sent to table in a jug. Here is one good recipe:—

JUGGED HARE, SIMPLE.

Take 1 hare, 1 bunch of sweet herbs, 2 onions, each stuck with 3 cloves, 3 whole allspice, ½ teaspoonful black pepper, a strip of lemon-peel, thickening of butter and flour, 2 tablespoonfuls of mushroom ketchup, and some small pieces of bacon, salt to taste. Wash the hare thoroughly in salted water, dry, and cut into small joints; flour and brown them; put them in a stew-pan, with the herbs, onions, cloves, allspice, pepper, and lemon-peel; cover with hot water; and when it boils, remove the scum and let it simmer gently 1¾ hours or more. Take out the pieces of hare; thicken the gravy with flour and butter, add the ketchup, let it boil for 10 minutes, strain over the hare, and serve. A few fried forcemeat balls should be added in serving, or they may be stewed for 10 minutes in the gravy. Serve with red currant jelly.

Here is another good one:—The hare is skinned, then wiped (not washed), cut up into pieces, and nicely fried in butter. A saucepan of boiling gravy must be in readiness to put the joints in as each is fried. All is allowed to simmer for 1 hour, then the pieces of hare are placed in a large tureen, the gravy flavoured with Armour's extract of beef and Yorkshire relish, and thickened with butter rolled in cornflour; 1 gill of port wine is now added, then the whole must be poured over the hare, boiling hot.

Black currant jelly accompanies this dish to table.

The dish is garnished with a dozen forcemeat balls, made with minced parsely, chopped suet, fine bread-crumbs, sweet lemon thyme, and the juice and the rind of a lemon, seasoned with pepper and salt to taste, rolled into shape with floured hands, and fried in butter.

When only the whites of eggs are required, the yokes may be kept for some time if they are put into a small cup, covered with a little cold water, and kept in a cool place.

DISEASE IN SUGAR-CANE.

It is reported on what appears to be good authority that a disease has broken out in the cane-fields on the Clarence River. It affects the Daniel Dupont cane, and seems to be most in evidence in the cane planted on forest land. It is remarkable that when in 1872 a disease attacked the Bourbon cane in Queensland it first made its appearance on the forest fields, the scrub following later on. From the description of the Clarence River disease, it would appear to be identical with the Bourbon "rust," as it was called. This attacked the cane after about 10 months' growth. Up to that time the canes looked green and healthy; then some obstruction appeared to exist in the top joint, and the top decayed so that the young top shoot could be pulled out and the cane gradually rotted away. Old planters will remember how the Bourbon cane had to be rooted out and harder varieties substituted. Perhaps the disease on the Clarence may be identical with that of Queensland. If so, a stand-over crop will be a thing of the past with the planters in that district, if, indeed, it does not lead, as it did in Queensland in the case of the Bourbon cane, to the entire extirpation of the Daniel Dupont and the substitution of some other suitable variety of cane. Still "one swallow does not make a summer," nor does one year's sickness make a confirmed invalid. Another season may see the disease vanish. At all events, let us hope so in the interests of our brother planters in the South.

POULTRY QUARANTINE IN VICTORIA.

It will be news (says *Garden and Field*) to many South Australians that that worst pest of the poultry-yard in this colony—the fowl tick or bug—is not at present found in Victoria. It is believed by some authorities to be identical with the camel bug, and to have been introduced into Australia with the early shipments of camels. Unfortunately, it has spread almost all over this colony, and wherever it is found necessitates the most watchful care on the part of the poultry-keeper. With a view to prevent its introduction, a series of regulations have been drawn up by the Government of that colony, by which it is enacted—

That no one shall introduce any kind of poultry or cages which have been during the preceding 6 months in contact with tick.

Poultry or fittings must be introduced at a port or place appointed.

Forty-eight hours' notice must be given to the inspector, with full particulars, and the owner must assist the inspector in examining the birds, &c.

A statutory declaration must be furnished declaring poultry fittings free from tick for 6 months.

POULTRY NOTES.

Cayenne pepper, or chopped chilies, given in the food will often stimulate laying.

Sunflower seeds give a gloss to the plumage. Lime is good for bone-growth and egg-shell material.

Salt meat will often deter hens from feather-pulling. A dose of turpentine will often cure the gapes.

The best cure for warts is a urine dip.

A mixture of fresh lard and coal oil in equal parts applied with a feather will cure scaly leg.

A nest-egg will usually stop a hen scratching the nest; if not, use shavings.

Sulphur blown down a chicken's throat will cure roup.

Green bone is superior to grain as egg-producing material; 1 lb. per day will be sufficient for sixteen hens.

For diphtheria a French remedy, said to be infallible, is—Glycerine, distilled water, 30; borate of soda, 8; hydrochlorate of cocaine, 1. The remedy is applied with a wing feather pushed far down the bird's throat.

Fowls are often troubled with gout. In such case rub the birds' legs with brandy, or with an ointment made of 100 parts of lard and 50 parts crushed camphor. Keep the birds in a dry place, supply tonic food, and put rusty nails in the drinking water.

Wheat is better for fowls than maize. It does not make them so fat, and, considering the number of eggs that can be secured by using it, is altogether a more economical food.

Tincture of iodine is said to be an infallible cure for warts on fowls. The tincture, which is very cheap, should be brushed over the warts with a feather every other day.

PREVENTING EGG-EATING.

ALL poultry-keepers know how difficult it is to prevent certain hens from eating their eggs. The following is a preventive, if not curative, method, recommended by a Belgian experimenter, and which deserves at least to be put to the test. First you must make a coop, or box, in lattice-work; the laths which form the bottom are at a distance of 2 or 3 inches from each other. This box is placed on legs 15 to 19 inches high, and below a thick layer of wheat husks is spread. In the morning the troublesome hen is taken from the hen-house and examined, to ascertain whether about to lay (this is done by placing the index finger in the cloaca, where the egg can be felt.) The hen is then shut in the box and there left. When she lays the egg, it falls through the laths into the husks below, and the hen misses her usual meal. You can then release her, and repeat the operation next day, if necessary.

You may also keep her in the coop for four or five days, giving her one day of freedom at the end of this time, and then putting her back again. This treatment continued for a fortnight saves all the eggs, and also cures the hen, or does something towards doing so. You can ascertain whether a cure has been effected as follows:—At the time of laying place a porcelain egg under the hen, without her being aware of it, securing the egg so as to prevent it falling through the laths. You can then easily see from the hen's behaviour whether she is cured or not; if so, you may release her at once, and if not you should get rid of her, or continue the treatment indicated.—*Aviculteurs Francais.*

LIME AS A REMEDY AGAINST FROST.

MR. W. G. CLOUGH, hon. secretary of the Mylor branch of the Central Agricultural Bureau of South Australia, stated at a meeting of the branch, last January, that he had read in an American paper that powdered quicklime applied to plants touched by frost would prevent any injury resulting therefrom. He therefore obtained some marble lime, hung it in a bag in a shed until it fell to powder, but was still quick. Early in the morning, whilst some potato plants were quite white with frost, he dusted them over with lime, putting it in a bran bag for that purpose, and before he had gone far he noticed vapour rising from the plants as the lime took in water and gave out heat. The potatoes so treated received no damage, while others not treated were cut down by the frost.

UTILISING ALKALINE SOILS.

WE have referred on one or two occasions to the alkaline patches which exist on some of the lands near Warwick. At the Hermitage Experiment Farm there may be seen several plots which are so alkaline in their nature that wheat either fails to germinate on them or at best yields a miserable return. As mangolds and beets, onions, Jersualem artichokes, and above all salt-bush will thrive on such soils, it would be worth while occupying the saline patches with these crops in preference to trying to fit them for wheat-growing.

WATERING GARDEN PLANTS.

In the very hottest weather it is no unusual sight to see amateurs watering their gardens with a watering-can, thinking that they are doing a good work, but they make a great mistake. The plants are simply scalded by the water heating when coming in contact with the burning soil, and by the steam due to evaporation. The best method of watering is one which we always adopt, especially in the case of young coffee-trees and garden shrubs. Take a number of beer bottles. Stand each on its neck, and give the "boss" in the bottom of the bottle a blow with a blunt iron instrument. The boss will fall out, turning the bottle into a funnel. Now bury one of these bottles at each plant, or even between two plants. Fill them up with water, or rather keep filling them up until no more flows from them and they remain full. By this means you secure irrigation below the surface, the moisture is sucked in by the roots, and no scalding can possibly occur. In this way plants may be watered during the very hottest part of the day should it be found necessary to to so, whereas by the watering-can system the gardener is simply destroying many of his most cherished plants.

A TURN-OVER GATE.

AN INGENIOUS CONTRIVANCE.

Many devices have been adopted for the automatic securing of farm gates, and some have been found to answer their requisite purpose. A new idea, however, which awaits a trial in this country, has occurred to Mr. S. G. Stevens, a well-known agriculturist of New York State. Mr. Stevens' novelty is a turn-over gate, and, whatever its practical utility may be, there cannot be much to complain about so far as cost of construction is concerned. The nature of the design is indicated in the three accompanying illustrations. An old wagon-tire is fastened to one end of the gate, and a common hook-and-eye hinge at the other. The hoop is nailed close to the end of the gate as shown.

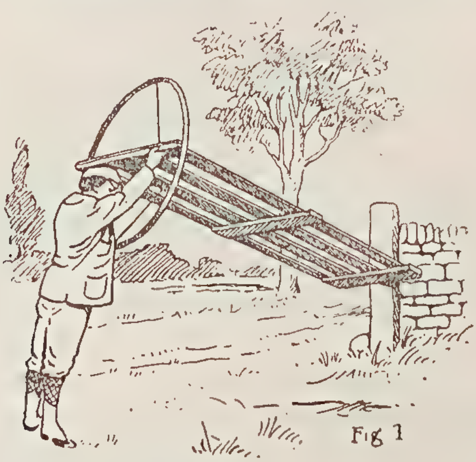

Fig 1

The hinge is made by boring, say, a $\frac{5}{8}$-inch hole into the centre board of the gate, so that it will extend in beyond the width of the end piece. Then into this hole should be driven a piece of gas-pipe, say 6 inches long, to form the hub. Into this hub should be put a piece of $\frac{1}{2}$-inch rod, with a nut on the inner end bent down to about 2 inches, so as to form a hook. The other half of the hinge consists of a simple eye-staple driven into the gate-post. These two when hooked together form a perfect universal joint, as the hook will revolve vertically in the eye and horizontally in the gas-piping. Thus the gate can be turned over or lifted, as shown in Fig. 1. When the gate is closed,

horses or cattle cannot push it open, for the simple reason that when they press the top part over the bottom of the gate rises and strikes their shins. This puzzles and annoys the animals, and they at once go away. In Fig. 2 this happy effect is displayed.

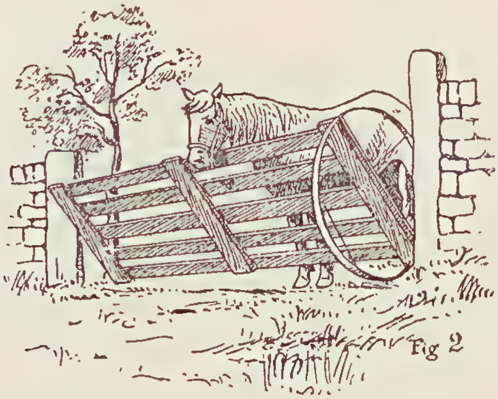

Fig 2

Pedestrians carrying a burden can pass through easily enough. It is merely necessary to roll out the wheel a little way, when the pails or other burden can be carried through, a slight push with the foot being sufficient to close the gate.

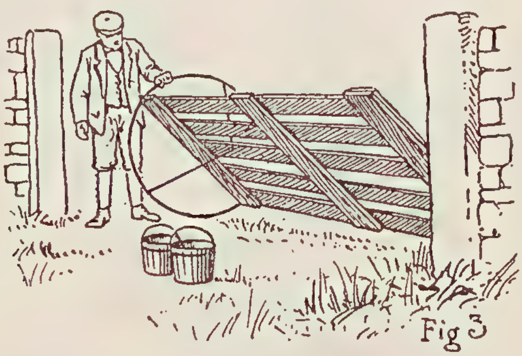

Fig 3

By grading the ground, or weighting the iron hoop, the gate can be made to shut automatically from any position. The whole idea is ingenious, if simple, and the fact that the inventor has taken out a patent for his notion shows that he believes there is something in it.—*Farmer and Stockbreeder.*

TO TEST WATER.

THERE is a simple test for the presence of sewage in water. All drinking water should be tested in town or country frequently, as there are other impurities besides sewage which are quite as deadly, and every cistern of water is liable to be a source of blood-poisoning. Mice, rats, and other pests must have water, and many a case of typhoid is set up by such as these falling into the cistern and remaining there for months in a decomposed state. To detect this impure condition is very simple and unfailing. Draw a tumbler of water from the tap at night, put a piece of white sugar into it, and place it on the kitchen mantel shelf, or anywhere that the temperature will not be under 60 degrees Fahrenheit. In the morning the water, if pure, will be perfectly clear; if contaminated by sewage or other impurities the water will be milky. This is a simple and safe test well known in chemistry.

ACTION OF STRYCHNINE SOLUTION.

Referring to an article in the February number of the *Journal*, dealing with the destruction of noxious animals by poison, the bandicoot dose is given as 6 m. grammes of strychnine, and the amount of strychnine on each grain of corn as 31 grains of 54 m. grammes. The result, mainly owing to the omission of a decimal is incorrect.

The result arrived at by Mr. J. B. Jenkinson, Miriam Vale, is that each grain of corn will hold ·03324 m. grammes, and a bandicoot or cockatoo would have to eat nearly 185 grains of corn to get a killing dose. Mr. J. B. Henderson, Government Analyst, puts it thus:—1 grain = 64·8 m. grammes. Thirty grains strychnine in 50,000 "corns" is $\frac{30 \times 64{\cdot}8}{50000}$ = nearly ·04 m. grammes per corn, and to make a dose of 6 m. grammes (bandicoot dose) 6 ÷ ·04 or 150 grains of corn would be required.

With regard to arsenic poisoning, Mr. D. Jones, Fruit Inspector, says that 1 part of arsenic mixed with 2 parts of washing soda, dissolved in 1 gallon of water, is pretty sure to achieve the desired result.

A DURABLE WHITEWASH.

A correspondent of the *Journal* complains that she was advised to whitewash her kitchen (a brick one) with freshly slaked lime. The lime was applied as directed, with the result that the walls presented the appearance of the hair of a kanaka after the customary lime bath—a dirty red colour. Here is a recipe for whitewashing which ought to be good, seeing that it is used by the United States Government for painting lighthouses, &c.:—Three parts of fresh Rosendale cement and two parts of clean, fine sand mixed thoroughly with fresh water. In applying it, the wall must be wet with clean, fresh water, to be followed immediately with an application of this cement wash. During the application this wash must be kept well stirred, and be made as thick as can be applied conveniently with a whitewash brush.

TO FIND THE NUMBER OF FEET OF BOARDS THAT MAY BE CUT FROM A LOG.

From the diameter of the log in inches subtract 4 inches for the slabs. Then multiply the remainder by half itself, and the product by the length of the log in feet, and divide the result by 8; the quotient will be the number of feet.

Example.

What is the number of feet of boards that can be cut from a log 24 inches in diameter and 12 feet long?

	Inches.
Diameter	24
Deduct for slabs	4
Remainder	20
Multiply by half remainder	10
	200
Multiply by length of log	12
Divide by 8 ... ...8)	2400
Number of feet in log	300

—*Farmers' Calendar*, New Zealand.

FOLDING SAWING-MACHINE.

We have from time to time illustrated many sawing-machines in the hope that the workers in the forests of the country would see something in them to suit their requirements, and lighten their labours. There is a handy form of folding sawing-machine, which is said to be doing good work in America. One man can carry it on his shoulder with ease, saw down his timber alone, and saw it up in logs or bolts. It saws down a tree anywhere from 4 inches to 27½ inches from the ground.

Any man accustomed to the machine can take it from his shoulder, unfold it, change it to sawing down a tree, change it back to sawing on a log, change it to sawing on a side hill, fold it up and place it on his shoulder again, and perform the whole operation in less than one minute's time. It is warranted to stand steady and work on any ground where two men can stand to run a crosscut saw, and saw any kind of timber from 1 inch to 5½ feet in diameter. No matter how rough the ground may be, or at what angle the log may be, if the log should lie at an angle of 45 degrees one way, and the ground where the machine is to be set, the same degree the other way, the machine can be adjusted instantly to the ground, log and direction desired to saw, and not a moment's time be lost in setting the machine.—*Town and Country Journal.*

WHAT FIFTY ACRES WILL DO.

With 50 acres of good land, ten good cows, plenty of good common sense, and enough energy to keep things moving, any farmer can make a good living, and feel a degree of independence unknown to the man who rents the lands of others, or farms his own to renters. As many as twenty cows can be fed on 50 acres, if care is taken to produce crops to suit the cows, for they must be consulted, or failure will result.—*Home and Farm.*

RAPE.

Rape is a splendid succulent food for pigs and sheep, and comes in a season when green feed is scarce. It is available from 6 to 8 weeks after sowing; requires but little cultivation, and can be grown to advantage. It is said an acre of rape is equal in pig-feeding to 2,600 lb. of grain mixture, consisting of two-thirds corn and one-third shorts. It should be sown on rich land.

TO DESTROY ANTS.

To cleanse a cupboard infested with ants, all the shelves should be washed with carbolic acid and water, or carbolic soap. If the scent of the carbolic is offensive, as it is offensive to some persons, use the following:—A large lump of ammonia dissolved in hot water, and cold added. The proportion is ammonia the size of a hen's egg to a quart of water. Brush the shelves well over with it. The ants will soon leave, as they greatly dislike the scent of ammonia.

UNFERMENTED GRAPE JUICE.

Bottling grape juice is as simple as canning fruit. It must be kept in a cool place and used soon after opening, the same as canned fruit, for exposure to the air will start fermentation. Strain pure juice from ripe grapes to remove any portions of pulp that remain in the juice as it comes from the press. Heat to nearly the boiling point, and bottle while hot. Put no sugar nor anything else in it. Bottle as soon as you can after it has been pressed from the grapes, so that there can be no chance for fermentation.

RUBBER FROM YEAR-OLD TREES.

The most interesting point under discussion in relation to rubber-planting in the British West Indies is a series of experiments now being carried on in London and Trinidad, by which it is proposed to secure rubber from year-old trees of the *Castilloa elastica.* It has been found that seeds sown broad-cast over a prepared field will yield an abundant crop of young trees, which at about a year old can be cut and sent to a factory where, with ordinary machinery operating a simple process, 8 per cent. of fine rubber can be extracted from the young shoots. This can be done in the laboratory. It is claimed that the process is a simple one, that but little machinery is necessary, and that in future the world's rubber supply will be secured from an annual crop of young trees sown on cultivated estates, and not from remote forests as at present. A series of experiments has shown that the young tree contains about 8 per cent. of rubber, which would at present prices return an estimated profit of 200 dollars to 400 dollars per acre. The extraction of rubber from young shoots has been accomplished chemically in the laboratory, but whether it can be applied to the economic production of rubber on a large scale remains to be seen.

A SIMPLE WAY TO MAKE ATTAR OF ROSES.

This delicious and valuable scent consists of the oil contained in the leaves of the flowers of roses. We learn from *Planting Opinion* that a Madras firm is about to plant an acre or two of Wynaad land with roses with a view to the manufacture of attar. It will be interesting to learn what process of preparation is to be adopted, and to follow the progress of the enterprise. There should be a profitable future for it, if it is conducted prudently and energetically, for the Indian demand must be very large, apart from the demand for export. The following is a recipe for making attar of roses, as it was prepared in India over 100 years ago. There are more modern methods, however:—Take a very large glazed earthen or stone jar, or a large clean wooden cask; fill it with the leaves of the flowers of roses, very well picked, and freed from all seeds and stalks; pour on them as much pure spring water as will cover them, and set the vessel in the sun in the morning at sunrise, and let it stand till the evening, then take it into the house for the night; expose it in this manner for 6 or 7 successive days, and at the end of the third or fourth day a number of particles, of a fine yellow oily matter, will float on the surface, which in 2 or 3 days more will gather into a scum, which is the attar of roses. This is taken up by some cotton, tied to the end of a piece of stick, and squeezed with the finger and thumb into a small phial, which is immediately well stopped; and this is repeated for some successive evenings, or while any of this fine essential oil rises to the surface of the water.

A CURE FOR LUMPY JAW.

Hoard's Dairyman has the following remedy for the disease known as "lumpy jaw" by John Judson, San Diego, California. We give it for what it is worth, as it is generally believed that there has been no remedy discovered as yet for this trouble:—

I see in queries in veterinary department, one concerning lumpy law from J. B. and Sons, Ransom, Michigan, and in answer the veterinary surgeon says, "No one who understands the true nature of actinomycosis will pretend to give a remedy."

Now, I will give my experience for what it is worth. Two years ago I had a very fine two-year-old Jersey heifer attacked with lumpy jaw. Having read in the veterinary department that there was no remedy for the disease, I let her go until the lump got so large and the heifer so poor that I killed her and put her out of her misery. But learning later that the disease had been cured by spirits of ammonia, I determined, if I ever had another case, I would give

the spirits of ammonia a trial. This last spring I had three fine Jersey heifers attacked with the disease; I let them go until the lump on one of them was as large as a goose-egg; I then commenced the ammonia treatment, rubbing the lump and jaw throughly with ammonia once a day for a week, then rested a week, and then gave them 3 day's treatment. It blistered them quite severely, the treatment seemed to be very painful, but they have no more of the disease of lumpy jaw to-day than the veterinary editor has. I advise all who have cattle afflicted with this terrible disease to try the remedy. It won't cost 10 cents (5d.) per head.

WET EARTH A BEE-STING CURE.

ALTHOUGH wet earth has long been known as a cure for bee and wasp stings, very few persons seem to be aware of its value as such. The following example may interest some of the readers:—

Four summers ago, at a picnic in the country, one of my boys found a wasps' nest, and must needs amuse himself pelting it with stones, resulting in his getting very badly stung in the face. Fortunately, I remembered having read of the wet-earth cure, and at once daubed his face with some mud from the road, with the happy result that in about 15 or 20 minutes all the painful effects had ceased, and very little swelling remained.

I have since then used this remedy when stung whilst manipulating my bees, and find it infinitely better than spirits of ammonia or other popular remedies, and the best of it is that it is always ready at hand.—*British Bee Journal.*

PASTEURISATION OF MILK.

GOOD butter can be made, and has been by thousands of tons, from milk or cream that has never been pasteurised. Pasteurisation is an aid to the attainment of uniformity, and is remarkably useful in treating milks that are tainted or gaseous from the cows being fed on rank fodder, such as lucerne.

WHEAT HARVEST IN SOUTH AUSTRALIA.

THIS year the average return of wheat in South Australia has been 6 bushels 20 lb. per acre, a great increase on the yield of last year when the average per acre was only 3 bushels 45 lb. The *South Australian Register* gives the total yield for 1898-99 as 9,816,666 bushels from 1,550,000 acres. This will leave a surplus available for export of 174,553 tons. The quality of the grain is reported to be excellent.

RUST-RESISTANT SEED WHEAT.

THERE is no preparation known which, used as a steep for seed-wheat, will ensure for the crop immunity against rust. That being conceded, the following letter published in the January number of the *Agricultural Journal* of the Cape of Good Hope will be read with interest. Mr. P. Rocher, of St. Helena, Fontein, writes to the Hon. J. H. Hofymeyr, Chairman of the Board of Directors:—

"It will no doubt interest you to know that an experiment, as you suggested to me the other day—viz., to sow wheat two years old as a preventive against rust—has by chance been made this year by Mr. Putter, in the district of Clanwilliam. He told me he got about 3 bushels of seed wheat which happened to be two years old, and that (after he had sown it) all the wheat sown on the same piece of land got rust, but that the wheat from the 3 bushels of old seed is perfectly free from it. He also sowed a bushel of two-year old 'Valparaiso Koorn.' This wheat is now 18 or 20 inches high, and quite green yet, but has no rust, notwithstanding that all the other wheat on

the same farm and same piece of land sown with new seed (1 year old) had rust. So this is a clear proof that sowing wheat 2 years old must be a remedy against rust."

The above statement is interesting, but we should hesitate to accept this trial of two-year-old seed as conclusive proof that it is absolutely a cure for the much-dreaded rust. We should very much like to have the opinion and experience of some of our Queensland wheat-farmers on this point. The trial is easily made, and costs nothing.—Ed. *Q.A.J.*

PLANTER'S FRIEND.

Last month we mentioned the loss sustained by the Messrs. Harding Bros., of Geraldton, by their horses eating Kafir corn. It was supposed by them that Kafir corn contained some poisonous element. Mr. F. M. Bailey, Government Botanist, gave it as his opinion that the animals in question had simply over-eaten themselves. We now have a similar instance in New South Wales, where thirty cows belonging to Mr. H. Breen, of Unanderra, being allowed to feed on a crop of young Planter's Friend, were taken so ill that in less than an hour twenty of them died, and during the night six more followed. They had only been feeding for a few minutes in the field.

THE SPARROW.

The ubiquitous sparrow lies under the ban of the rural authorities. In England, says the *Burton Chronicle* (or rather in Burton), every farmer having 50 acres of land has to kill 100 sparrows, and a writer in the sparrows' defence calculates that "from May to September each sparrow would destroy 500 caterpillars per week and 4,000 extra for feeding their young, which is equal to a total of 7,900,000 caterpillars in 6 months for the 100 sparrows. Half these caterpillars would produce female moths, each laying 100 eggs, producing 39,500,000 caterpillars next season."

In Queensland we have the sparrow. The impudent, feathered street Arab may be seen all over our coast towns and in the rural suburbs. He is an outcast, and is destroyed wherever possible. But we know that the poor birds do far more good than harm. If anyone will take the trouble to watch their proceedings, he will be surprised to note that whilst they will come and dispute the cracked corn with the fowls at feeding time, whilst they will watch the sower in the field and garden, and pick up a few seeds when his back is turned, they are equally busy amongst caterpillars. The numbers of these pests which we have seen carried off to their nests for the purpose of feeding their young is incredible. They also relish the flesh food themselves. We ask any unprejudiced person to look at the beauty of our Botanical and Acclimatisation Gardens and at hundreds of other gardens in Brisbane and its suburbs in the spring of the year, and then declare what injury the birds have done to them by picking up seeds. If they were such a curse to the horticulturist and fruitgrower, how does it happen that we have any flowers or small fruit (berries) at all? According to some who will not take the trouble to study the habits of birds and insects, there should be no strawberries, cherries, gooseberries, or currants in Australia. But the detractors of the sparrow have as much idea of the habits and food of wild birds as those who yet believe that the ant attacks wheat-fields, and lays up large stores of wheat as a provision for winter, when, as a matter of fact, the so-called wheat grains they have been seen carrying from one nest to the other are really their eggs, which have the appearance of wheat. Is there anyone who has ever seen an ant eating wheat or any other grain? Ask the housewife whether the ants visit the safe to eat bread. It is flesh food, cheese, and sugar that they carry off. So with the sparrow, he is supposed to eat nothing but grain and fruit, when as a matter of fact he destroys millions of noxious insects, and fruit-growers need scarcely grudge the poor birds a few berries in return for the

good services they render them. Birds which live in a wild state, mainly on insects, have a peculiar gamy flavour. Take a woodcock, pheasant, wild duck, quail, scrub turkey, for instance—all have that particular flavour arising from an insect or animal diet. The sparrow has this same flavour, and is most excellent eating as a game bird, a proof that his diet is not confined to grain. For the reasons given the sparrow should be treated more kindly, and certainly not be classed as vermin.—Ed. *Q.A.J.*

On this subject we lately received a communication from a friend, who grows a little fruit in his garden, to the following effect:—"I am more than pleased to know one, at least, of our community who has a word to say in defence of the poor sparrow. Having watched with interest the habits of that bird for a great length of time, I am able to endorse your opinion as regards its usefulness to the orchardist in destroying insect pests as well as caterpillars. The fruitgrowers of Queensland have a far greater curse to contend with in the whole-year-round-protected 'leather-head,' whose periodical depredations amongst the vineyards are well known to all who are occupied in the cultivation of the grape. One orchardist informed me that during the grape season he had to keep a loaded gun almost constantly at hand (killing about eighty birds before 11 o'clock) whilst working in the vines. They never eat insects, but are supposed to be honey-eaters, like the warty-faced honey-eater, the slender-billed spine bill, and others. Why protection should be afforded to leather-heads, I fail to see."

PRESERVING FRUIT WITHOUT SUGAR.

Mr. G. Trow, of Rocklea, says that he has invariably succeeded in preserving plums, peaches, pears, &c., without the use of sugar by the following plan:—Fill a number of fruit-bottles or pickle-bottles, of the ordinary type, with the fruit intended to be preserved. Pour in water to completely cover the fruit. Set on a boiler with sufficient water to reach the level of the water in the bottles when placed in it. Let the water boil gently for 5 minutes in the case of soft fruit—for 45 minutes in the case of pears. Try the top fruit with a fork. If at the end of 5 or 7 minutes it is soft, the fruit has boiled sufficiently. Remove the bottles from the boiler, inserting the cork immediately. A saucepan of boiling sealing-wax should be ready at hand. Into this plunge the top of the bottle, turning it round until the wax has set. By this plan fruit can be kept in bottle for twelve months without deterioration, but the wax must be applied the instant the bottle has been corked; otherwise, as the contents of the bottle cool, air will find its way in, and in a couple of months a white fungoid scum will appear on the surface of the liquid in the bottle.

A somewhat similar recipe for the preservation of grape-juice, or the juice of any fruit, by which the natural flavour is entirely unaltered, we find in the *Journal of Agriculture of South Australia*:—Press out the juice and strain through filter bags (made of fine flannel), then heat the juice slowly to 170° Fahr., and keep it at that point for 10 minutes. Have clean bottles in water nearly boiling; take one out, empty water out, fill at once with the fruit juice, cork with corks that have also been just taken out of nearly boiling water. Proceed this way till all the juice is bottled and sealed.

Yet another plan is given in the March number of the *Tropiculturist* (Brisbane), which is to fill the bottles as full as they can with fruit, taking care that it is not bruised, and pour as much boiling water into the bottles as they will hold, and at once cork them up tightly and cover with bladder.

AGRICULTURAL AND HORTICULTURAL SHOWS.

The Editor will be glad if the secretaries of Agricultural and other Societies will, as early as possible after the fixture of their respective shows, notify him of the date, and also of any change in date which may have been decided on.

The Markets.

AVERAGE PRICES FOR FEBRUARY.

Article.		FEBRUARY. Top Prices. £ s. d.
Bacon	lb.	0 0 7
Bran	ton	4 17 6
Butter, First	lb.	0 0 8⅞
Butter, Second	"	0 0 5¼
Chaff, Mixed	ton	3 16 3
Chaff, Oaten	"	4 6 3
Chaff, Lucerne	"	3 7 6
Chaff, Wheaten	"	3 0 0
Cheese	lb.	0 0 7¼
Flour	ton	7 15 0
Hay, Oaten	"	3 13 3
Hay, Lucerne	"	2 10 0
Honey	lb.	0 0 2
Japanese Rice, Bond	ton	13 2 6
Maize	bush.	0 4 1¾
Oats	"	0 3 5¾
Pollard	ton	5 15 0
Potatoes	"	7 6 3
Potatoes, Sweet	"	4 0 0
Pumpkins	"	3 16 3
Sugar, White	"	14 5 0
Sugar, Yellow	"	11 7 6
Sugar, Ration	"	9 2 6
Wheat	bush.	0 3 5¼
Onions	cwt.	0 5 11¼
Hams	lb.	0 0 9⅝
Eggs	doz.	0 0 11¾
Fowls	pair	0 3 9
Geese	"	0 3 7½
Ducks, English	"	0 2 8¼
Ducks, Muscovy	"	0 4 6
Turkeys, Hens	"	0 6 7½
Turkeys, Gobblers	"	0 13 7½

We have received no information concerning Enoggera Cattle Sales.

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Orchard Notes for April.

By ALBERT H. BENSON.

CITRUS are undoubtedly the fruits of the month, especially in the Maryborough and Northern coastal districts of the colony, so that a few words on their gathering, handling, and packing may not be altogether out of place, as the success or failure of an orchard depends quite as much on the careful handling and packing of the fruit as on any other orchard operations throughout the year.

In the first place, too great care cannot be exercised in the gathering of the fruit so as to prevent injury from bruising or otherwise, as a bruised fruit is always a spoilt fruit and will not carry. All citrus fruits, especially mandarins and lemons, should be cut instead of being pulled from the trees, clippers made for the purpose being used. In pulling citrus fruits you are apt to injure the fruit; the skin at the stem end being either lifted or entirely pulled out (plugged), which causes the fruit to decay from this spot, and this cause of loss is entirely obviated when the fruit is carefully cut. When cut, the fruit should be gently handled so as to prevent any bruising, and should be placed in cases to sweat, so as to toughen the skin and render it less liable to injury when packed. When sweated, the fruit should be graded to size, and then firmly packed into the cases in which it is to be marketed or exported. Ordinary fruit, if firmly packed, will not need wrapping for intercolonial trade; but all fruit for export, and also extra quality fruit for intercolonial trade, will pay to be wrapped in good-quality, tough tissue-paper. Careful gathering, handling, grading, and packing are the secrets of success in marketing citrus fruits; close attention to same will result in a profit to the shipper, and neglect will mean failure.

During the month the orchard should be kept thoroughly cultivated, and where not already done should be got into proper shape after the summer rains so as to be ready for the winter work. New land to be set out to orchard should be got into order, as it is advisable to start early in order to get the land thoroughly pulverised and sweetened before planting the trees.

Insect and fungus pests should be fought wherever and whenever found, and all fruits, citrus especially, that are exported from the colony, should be cleaned from all scale or other insects infesting them. These remarks apply not only to citrus fruits but also to bananas, pineapples, custard apples, &c., as no fruits should be exported from Queensland unless they are free from disease of any kind.

Care should be taken to gather and destroy any guavas that may be lying under the trees, as these fruits are the breeding-grounds of the fruit fly, and if not destroyed are the medium of carrying this great fruit pest over from one season to another, so that it is impossible to devote too great care to the destruction of all fallen guavas or other fruits during the autumn, as by carefully attending to this the crop of fruit flies for the succeeding season will be materially diminished.

Farm Notes for April.

SOUTHERN QUEENSLAND.

The ripened maize crops should now all be got in, and the land not yet ready for early wheat should be got into order as soon as possible, as sowings may be made this month. The main potato crop planted during last month will be ready to earth up. Where cotton is grown, the pods are now bursting, and picking should be carried on as soon as the night dew has evaporated. Sorghum seed will be ripe, and should be gathered in as it ripens. Watch the tobacco crop and gather the leaves as they ripen. Lucerne may be sown, and what was sown last month must be kept clean, although the growth of weeds has now slacked off. Sow oats, barley, rye, wheat, mangolds, and Swede turnips. All vegetable seeds may still be sown.

NORTHERN QUEENSLAND.

The weeds are still troublesome in the tropical portions of the North, especially since the late heavy rains; therefore every endeavour must be made to keep them in check. Sugar-cane must be regularly trashed. There are some planters who do not believe in trashing, but there can be little doubt of the advantages to be derived from the work, as the sun and air are thus enabled to gain free access to the canes to their manifest benefit, and noxious insects are not afforded cover under which to carry on their depredations. Coffee-picking will now be commenced. Tobacco should now be growing strongly, and a good look-out must be kept for insect pests. Transplant all healthy plants from the beds into the field. Make sowings of peas, English potatoes, French beans, lettuce, carrots, in cool spots on good soil. Egg fruit (*Solanum ovigerum*) should now be ready to gather. The planting of coffee in prepared nurseries may now be commenced. Sow opium poppy (*Papaver somniferum*), using plenty of manure from the piggery. Cold nights may now be looked for; the minimum temperature at times may reach 54 degrees Fahr. The leaves of some of the earlier varieties of tobacco should be gathered. Kohl rabi does well if planted this month. Make sowings of cow pea. Seeds of *Spondias dulcis* may be sown. Extract the fibre from *Hibiscus sabdarifera*, and plough in cow pea. Some wheat may be sown as well as oats for crops of green fodder if favourable weather ensues after the rainy season. Water all vegetables with diluted kainit. The buds will be developing on *Theobroma Cacao*. Commence the distribution of coffee seeds.

Garden Notes for April.

Kitchen Garden.—Hoe continually among the crops to keep them clean, having beds well dug and manured as recommended last month for transplanting the various vegetables now coming on. Thin out all crops that are overcrowded. Divide and plant out pot herbs, giving a little water if required until established. Sow broad beans, peas, onions, radish, mustard, cress, tree and potato onions, or the same as in March. Early celery should be earthed up in dry weather. Go carefully over the plants with your hands to prevent the loose soil getting between the leaves, one hand holding up the leaves, the other earthing round each plant. Fill up occasionally, and your celery will be ready in about two months. Transplant cabbages and cauliflowers.

Flower Garden.—The operations this month will depend greatly on the weather. If wet, both planting and transplanting may be done at once, as there is some chance of getting them established before the winter sets in. Camellias, gardenias, &c., may be removed with safety. Plant out all soft-wooded plants, such as verbenas, petunias, penstemons, &c. Cut away all dead branches, hoe all borders, and stake plants that may require it. Plant bulbs, and mark them with a stick so as not to destroy them in hoeing or digging. Sow annuals, as carnations, pansy, mignonette, daisy, snapdragon, dianthus, stock, candytuft, phlox, sweet peas, &c. Plant bulbs same as in March.

Public Announcements.

The Editor will be glad to receive any papers of special merit which may be read at meetings of Agricultural and Pastoral Associations in Queensland, reserving, however, the right to decide whether their value and importance will justify their publication.

We shall be pleased to receive reports of the progress of Butter and Cheese Factories and Creameries for publication.

The *Queensland Agricultural Journal* will be supplied to all members of Agricultural and Horticultural Societies who do not derive their livelihood solely from the land, on payment, in advance, of an annual subscription of 5s.

GOVERNMENT AGRICULTURAL LABORATORY.

INSTRUCTION FOR THE COLLECTION OF SAMPLES, AND SCALE OF FEES.

GENERAL INSTRUCTIONS.

1. All analyses are carried out in their turn as they arrive at the Laboratory.

2. Should a customer wish for an immediate analysis, the fee, as provided by scale of fees below, will be increased by 50 per cent.

3. The samples may be forwarded by parcel post or by rail, either to the Under Secretary for Agriculture, Brisbane, or direct to the Chemist, Agricultural Laboratory, at the Agricultural College, Gatton; but in any case the required fee must be transmitted at the same time.

4. Analyses will be only carried out, if samples are taken strictly in accordance with the instructions issued below.

SCALE OF FEES.

	Farmers, Selectors, Gardeners. £	s.	d.
Soil—Short analysis (estimation of lime, alkalies, nitrogen, and phosphoric acid)	2	2	0
Soil and Subsoil—Short analysis	3	3	0
Soil—Complete analysis	4	4	0
Water—Analysis	3	3	0
Manures—			
Complete analysis	2	2	0
Nitrogen only	0	7	6
Potash only	0	7	6
Phosphoric acid sol.	0	15	0
Phosphoric acid insol.	0	15	0
Food Stuffs—			
Complete analysis	2	2	0
Water only	0	5	0
Albuminoids	0	10	0
Oil or fat	0	7	6
Ash	0	5	0
Fibre	0	7	6
Sugar-cane, sugar-beet, megass—Analysis of	1	1	0
Sugar, massecuite, jelly, molasses	1	1	0
Milk, butter, cheese—Complete analysis	1	0	0
Tanning materials (tannin estim.)	1	0	0
Soaps	1	10	0
Limestone, cement, clay, &c.	3	0	0

INSTRUCTIONS FOR TAKING AND COLLECTING OF SAMPLES.

SOILS AND SUBSOILS.

To obtain a fair average sample of the soil of a block of land, as near as possible, equal quantities of soil are taken from various parts of the fields.

A sketch plan of the field, paddock, or block of land on which the samples were taken should accompany the samples, and the spots where samples are taken are marked on this plan and numbered. This sketch plan should also indicate position of roads, creeks, gullies, ridges, general fall of the land, &c.

Should the soil in various parts of the block show a very marked difference, it will be necessary to divide the block into two, rarely in more, parts. Should the different soil occur only in a small patch, this sample may be left out.

Not less than three samples should be taken in each section. A greater number is to be preferred, as a better average will be obtained.

At the places chosen for the taking of the samples the surface is slightly scraped with a sharp tool, to remove any surface vegetation which has not as yet become part of the soil.

Vertical holes from 10 to 18 inches square are dug in the ground to a depth of 2 feet 6 inches to 3 feet.

The holes are dug out like post-holes; an earth-auger facilitates the operation considerably, and the holes may be trimmed with the spade afterwards.

Careful note of the appearance of the freshly cut soil and subsoil should be taken. The depth of the real soil, which in most cases is easily distinguished, is also measured and noted for each hole. Note how deep the roots of the surface vegetation reach into the soil. If the soil changes gradually into the subsoil, as is the case in some places where the soil is of very great depth, this line of division is guessed approximately, or it is best to take the soil uniformly to a depth of 12 inches.

With a spade a slice of soil is now cut off and put on to a clean bag. The same is done with the subsoil, and the slice is taken from where the soil ends (or 12 inches) to the bottom of the hole, and this subsoil placed on another bag. Stones over the size of a pea may be picked out, the rough quantity of such stones estimated, and a few enclosed with the samples. Fine roots must not be taken out from the soil samples. The same operation is repeated at the other places chosen. Careful note and description in each hole, as numbered and marked on plan given, and the samples of soil collected on the one bag thoroughly mixed by breaking up any large clods, and about 10 lb. of the mixture put into a clean canvas bag, which is securely tied up and labelled. The same is done with the samples of subsoil collected on the other bag.

All the samples collected are afterwards placed into a wooden box.

It is important to use clean bags and clean boxes, and also that the samples should not be left in the neighbourhood of stables or manure heaps. A short description of the land must accompany the samples and the sketch plan.

In the case of cultivated land, state how long the land was under cultivation, what crops were chiefly grown, result of such crops, was any manure applied, when, and what sort, and in what quantities per acre. In the case of virgin soil, state if the land was heavily timbered or not, ringbarked, if scrub or forest land, what sort of timber was chiefly growing on the land. In all cases a description of the neighbouring land, outcropping rocks, &c., are of great value. Also state if the land is naturally or artificially drained or not; describe the land as regards its position to hills, roads, creeks, ridges, &c. Only by adhering strictly to these instructions, and by giving minute details, benefit can be derived from the soil analyses.

WATER.

It is best to collect and forward samples of water for analysis in stoppered glass bottles, generally known as Winchester quarts.

The bottles have to be perfectly clean, and stoppers must fit well. Corks should be avoided, but if used must be new and well washed with the water before being used for closing the bottle.

When taking waters from taps, pumps, bores, the water has to be allowed to run for a while before taking the sample. When taking the water out of a well, pond, or river, the bottle is completely immersed, but care has to be taken not to disturb the mud or sediment at the bottom of the water. Before the sample is actually collected, the bottle is rinsed three times with the water, filling each time about one-third full. The bottle is then filled within about 1 inch from the top; the stopper is inserted and securely tied down with a clean piece of linen or calico.

The stopper must not be fastened or luted with sealing-wax, paste, plaster of paris, &c.

MANURES.

When taking samples of artificial manures out of bags, the sample must be taken from different bags and at different places of the bag and not only from the top, or the bags before being used are emptied on a heap and mixed up well and the sample then taken. About 1 to 2 lb. put into a clean bag should be forwarded for analysis.

FOOD STUFFS.

It is always important to obtain good average samples, and this can only be done by great care in taking the samples from different places, mixing well, and taking a small part of the mixture. This method would apply to any dry food-stuff—as grains of any kind, peas, beans, chaff, pollard, meal, &c. For the analysis of green foods—as green hay, sorghum, silage—it is best to make a mixture of the sample by passing it through a chaffcutter, and by taking an accurately weighed quantity—say 1 lb. This quantity may then be dried in the sun, taking care that nothing is lost, and when dry put in a bag and forwarded for analysis. The green samples may also be forwarded without drying in fruit-preserving jars.

To collect information about value of *green manures*, it is best to plot out exactly one square yard in the field covered with the plant, not picking out a position where the growth is very heavy or poor, but about a fair average. Four pegs are driven into the ground at the four corners, and string stretched between them; with a sharp spade all the plants are cut along the strings, so as to get really the growth of one square yard. The plants are all collected and accurately weighed, passed through a chaffcutter, and the sample for analysis taken as above described. In many cases the roots may be also pulled out, weighed separately, and a sample forwarded.

The samples have to be accompanied by a description of the crop—when planted, how old when cut, if the land was manured or not, weight of crop per acre or per square yard, and weight of the sample forwarded when in its green state. In the case of green manures it is generally best to take the samples at the same time when ploughed under, just after flowering.

"THE DISEASES IN PLANTS ACT OF 1896."

Department of Agriculture,
Brisbane, 19th January, 1899.

HIS Excellency the Governor, with the advice of the Executive Council, and in pursuance of the provisions of "*The Diseases in Plants Act of* 1896," has been pleased to make the following further Regulations.

J. V. CHATAWAY.

THE FUMIGATION OF FRUIT FOR EXPORT.

1. Any one who wishes to erect a chamber or building for the fumigating of fruit is requested to give notice to the Under Secretary for Agriculture, who will take steps to see that the chamber or building is properly constructed.

2. When it is required to fumigate fruit for export, twenty-four hours' notice must be given to the said Under Secretary or such other officer as may be duly authorised to accept such notice.

3. The operation of fumigating must be conducted under the control of an officer authorised by the Minister for Agriculture.

4. The fumigating chamber may be made of any convenient size or material, the essential point being that it shall be capable of being closed absolutely airtight, and provided with a flue-pipe in the roof which can be opened or closed to allow of the escape of the gas after fumigation. The flue must be provided with a box or chamber to contain caustic soda or potash to destroy the gas.

The fumigating chamber must be provided with a shutter or sliding panel in the lower portion of the door or wall.

Door, flue, and shutter must all be made to close absolutely airtight.

DIRECTIONS FOR FUMIGATING WITH HYDROCYANIC ACID GAS.

Proportions of Ingredients.—For every 150 cubic feet of room take 1 ounce of cyanide of potassium, 5 fluid ounces sulphuric acid, 10 fluid ounces water.

Having placed the fruit to be fumigated in the chamber, see that the flue and the shutter in the door or lower part of all are properly closed.

The acid is then to be diluted in the following manner:—The whole of the water is placed in a shallow china or glazed earthenware vessel, such as an ordinary wash-hand basin. (Metal vessels are inadvisable unless they are leaden ones.) The sulphuric acid is next poured on to the water in a thin stream, stirring the while with a stick. Do not mix by adding the water to the acid.

The basin containing the acid thus diluted (which should be allowed to cool) is now placed in the fumigating chamber, and the cyanide of potassium is emptied into it.

The gas is given off with great violence, and the door should be immediately closed.

The whole is now to be left to itself for one hour. At the end of this time the shutters in the flue and in the door are opened, and the draught produced drives the gas out of the chamber. At the end of half an hour the door is thrown open, and if the draught has been effective there should be hardly any trace of hydrocyanic gas recognisable. The chamber may be left in this condition for another ten minutes or a quarter of an hour. The fruit is now to be moved and allowed to remain in a well ventilated place, preferably out of doors, for another half an hour. Samples of fruit will be examined from time to time by the entomologist.

Caution.—As hydrocyanic acid gas is most deadly in its effects on animal life, the greatest care must be taken in its use.

Department of Agriculture,
Brisbane, , 18 .

This is to certify that has treated cases of citrus fruit with hydrocyanic acid gas for one hour, under my supervision. These cases have been branded "Crown" over "Passed."

Shipping marks:
Per S.S.:
Consigned to:

Department of Agriculture,
Brisbane, 26th January, 1899.

THE following Proclamation by His Excellency the Governor of New South Wales is published for general information.

J. V. CHATAWAY.

New South Wales, to wit. (L.S.) Hampden, *Governor.*

PROCLAMATION.

By His Excellency The Right Honourable Henry Robert, Viscount Hampden, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

Whereas the Governor is empowered by Section 9 of the "Vegetation Diseases Act, 1897," from time to time, by Proclamation in the *Gazette*, to declare any fungus or vegetable parasite whatever to be a fungus within the meaning of the said Act: Now, therefore, I, Henry Robert, Viscount Hampden, the Governor aforesaid, with the advice of the Executive Council, do, by this my Proclamation, declare Black Spot (*Fusicladium*) to be a fungus within the meaning of the said Act.

Given under my Hand and Seal, at Government House, Sydney, this twenty-second day of December, in the year of our Lord one thousand eight hundred and ninety-eight, and in the sixty-second year of Her Majesty's reign.

By His Excellency's Command,

JOSEPH COOK.

God Save the Queen!

LIST OF AGRICULTURAL, HORTICULTURAL, AND PASTORAL SOCIETIES AND ASSOCIATIONS IN QUEENSLAND.

Postal Address.	Name of Society.	Name of Secretary.	Date of Show.
Allora ...	Central Downs Agricultural and Horticultural Association	J. H. Buxton... ...	
Beaudesert ...	Logan and Albert Pastoral and Agricultural Society	M. Hinchcliffe ...	23 June
Beenleigh ...	Agricultural and Pastoral Society of Southern Queensland	Wilson Holliday ...	15 Sept.
Biggenden ...	Biggenden Farmers' Association	Charles H. Peppin ...	
Birthamba ...	South Kolan Agricultural and General Progress Association	G. W. Nixon ...	
Blackall ...	Barcoo Pastoral Society	F. Clewett	
Boonah ...	Fassifern and Dugandan Agricultural and Pastoral Association	J. A. McBean ...	18 and 19 May
Bowen ...	Pastoral, Agricultural, and Mining Society ...	J. E. Smith	8 June
Bowen ...	Preston Farmers' Association	R. A. Foulger ...	
Bowen ...	Proserpine Farmers' and Settlers' Association	G. W. Pott	
Brisbane ...	Horticultural Society of Queensland	G. K. Seabrook ...	21 and 22 April and 10 Oct.
Brisbane ...	Moreton Agricultural, Horticultural, and Industrial Association	J. Duffield	
Brisbane ...	Queensland Acclimatisation Society	E. Grimley	
Brisbane ..	Queensland Fruit and Economic Plant Growers' Association	G. K. Seabrook ...	
Brisbane ...	National Agricultural and Industrial Association of Queensland	H. C. Wood	10, 11, and 12 Aug.
Brisbane ...	Queensland Stockbreeders' and Graziers' Association	F. A. Blackman ..	
Brisbane ...	United Pastoralists' Association	Fredk. Ranson ..	
Bundaberg ...	Bundaberg Agricultural and Pastoral Society	A. McIntosh... ..	12, 13, and 14 Oct.
Bundaberg ...	Bundaberg Horticultural and Industrial Society	H. E. Ashley... ...	
Bundaberg ...	Woongarra Canegrowers' and Farmers' Association	H. Cattermull ...	
Burpengary...	Burpengary Farmers' Association	C. H. Ham	
Caboolture ...	Caboolture Farmers' Association	G. Mallet	
Cairns ..	Barron Valley Farmers' and Progress Association	W. F. Logan... ...	
Cairns ...	Cairns Agricultural, Pastoral, and Mining Association	A. J. Draper... ...	28 and 29 Sept.
Cairns ...	Hambledon Planters' Association	E. Whitehouse ...	
Charleville ..	Centra Warrego Pastoral and Agricultural Association	A. J. Carter	25 and 26 May
Charters Towers	Towers Pastoral, Agricultural, and Mining Association	W. Tilley	
Childers ..	Isis Agricultural Association	H. Epps	
Childers ...	Childers Progress Branch, Isis Agricultural Association	N. Rosenlund ...	
Childers ...	Doolbi Mill Branch, Isis Agricultural Association	W. T. H. Job ...	
Childers ...	Childers Mill Branch, Isis Agricultural Association	H. Epps	
Clermont ...	Peak Downs Pastoral, Horticultural, and Agricultural Society	F. Leysley	
Clermont ...	Peak Downs Dairymen and Settlers' Association	A. G. Pursell ...	
Cooktown ...	Cook District Pastoral and Agricultural Society	W. R. Humphreys ...	
Cordalba ...	Cordalba Farmers' Association	B. Goodliffe	
Currajong ...	Currajong Farmers' Progress Association ...	Wm. Howard ...	
Cunnamulla	South Warrego Pastoral Association	J. Winward	
Degilbo ..	Degilbo Farmers' Progress Association ...	F. A. Griffiths ...	
Gayndah ...	Gayndah Agricultural and Horticultural Association	J. C. Kerr	

AGRICULTURAL AND HORTICULTURAL SOCIETIES—*continued.*

Postal Address.	Name of Society.	Name of Secretary.	Date of Show.
Gin Gin ...	Pastoral and Agricultural Society of Gin Gin	E. K. Wollen ...	
Gladstone ...	Gladstone Pastoral and Agricultural Association	W. J. Manning ...	
Gooburrum, Bundaberg	Gooburrum Farmers' and Canegrowers' Association	W. J. Tutin	
Goondiwindi	MacIntyre River Pastoral and Agricultural Society	A. Gough	
Gympie ...	Agricultural, Mining, and Pastoral Society	F. Vaughan	14 and 15 Sept.
Gympie ...	Gympie Horticultural Society	W. G. Ambrose ...	
Halifax ...	Herbert River Farmers' League	J. Lely	
Helidon ...	Helidon Scrub Farmers' Progress Association	M. Morgan	
Herbert River	Halifax Planters' Club	H. G. Faithful ...	
Herbert River	Macnade Farmers' Association...	E. C. Biggs	
Herbert River	Ripple Creek Farmers' Association	J. W. Grimes ...	
Herberton ...	Mining, Pastoral, and Agricultural Association	John M. Hollway ...	3 and 4 April
Hughenden...	Hughenden Pastoral and Agricultural Association	W. H. Mulligan ...	10 and 11 May
Ingham ...	Herbert River Farmers' Association	...	
Ingham ...	Herbert River Pastoral and Agricultural Association	P. S. Cochrane ...	3 Sept.
Ipswich ..	Ipswich and West Moreton Agricultural and Horticultural Society	P. W. Cameron ...	6 Oct.
Ipswich ...	Queensland Pastoral and Agricultural Society	Elias Harding ...	1 and 2 June
Kandanga (near Gympie)	Kandanga Farmers' Association	N. Rasmussen ...	
Kolan ...	Kolan Canegrowers' and Farmers' Association	C. Marks	
Laidley ...	Lockyer Agricultural and Industrial Society	John Fielding ...	26 and 27 July
Loganholme...	Logan Farming and Industrial Association ...	F. W. Peek	
Longreach ...	Longreach Pastoral and Agricultural Society	J. P. Peterson ...	12 April
Lucinda Point	Victoria Farmers' Association	W. S. C. Warren ...	
Mackay ...	Agricultural, Pastoral, and Mining Association	F. Black	
Mackay ...	Pioneer River Farmers' Association	E. Swayne	28 and 29 June
Maryborough	Maryborough Horticultural Society	H. A. Jones	
Maryborough	Wide Bay and Burnett Pastoral and Agricultural Society	G. Willey	5, 6, and 7 July
Miallo ...	Miallo Progress Association	E. F. Welchman ...	
Milbong ...	Milbong Farmers' Association	T. R. Garrick ...	
Mitchell ...	Mitchell and Maranoa Pastoral, Agricultural, and Vinegrowers' Association	H. J. Corbett ...	
Mosman River	Mosman River Farmers' Association	..	
Mount Mee...	Mount Mee Farmers' Association	R. Thomas	
Mount Morgan	Mount Morgan Mining, Agricultural, Poultry, Pastoral, and Horticultural Society	G. Orford	
Mount Morgan	Mount Morgan Agricultural, Pastoral, and Poultry Society	Thos. W. Walker ...	
Mulgrave ...	Mulgrave River Farmers' Association ...	Thos. Swan	
Nerang ...	South Queensland and Border Pastoral and Agricultural Society	W. J. Browne ...	
North Isis ...	North Isis Canegrowers' Association	W. J. Young ...	
Pialba ...	Pialba Farmers' Association	J. B. Stephens ...	
Pinbarren ...	Pinbarren Agricultural and Progress Association	H. Armitage, senr. ...	
Rockhampton	Central Queensland Farmers' and Selectors' Association	T. Whitely, Coowonga	
Rockhampton	Central Queensland Pastoral Employers' Association	G. Mackay	

AGRICULTURAL AND HORTICULTURAL SOCIETIES—*continued.*

Postal Address.	Name of Society.	Name of Secretary.	Date of Show.
Rockhampton	Central Queensland Stockowners' Association	R. R. Dawbarn ...	
Rockhampton	Rockhampton Agricultural Society	R. R. Dawbarn ...	10 and 11 May
Roma ...	Western Queensland Pastoral and Agricultural Association	H. K. Alford ...	25 and 26 July
Roma ...	Yingerbay Farmers' Association	F. E. Glazier... ...	
Rosewood ...	Farmers' Club	P. H. Adams... ...	25 Aug.
Springsure ...	Queensland Pastoral Society	G. R. Milliken ...	
Stanthorpe ...	Border Agricultural, Pastoral, and Mining Society	Geo. Simcocks ...	
Stanthorpe ...	Stanthorpe Horticultural and Viticultural Society	R. Hoggan	
St. George ...	Balonne Pastoral and Agricultural Association	T. M. Cummings ...	
Tinana ...	Tinana Fruitgrowers' and Farmers' Association	Chas. Parke	
Toowoomba	Darling Downs Horticultural Association ...	H. Hopkins	
Toowoomba	Drayton and Toowoomba Agricultural and Horticultural Society	H. Symes	
Toowoomba	Royal Agricultural Society of Queensland ...	F. Burtt	2, 3, and 4 Aug.
Townsville ...	Townsville Pastoral, Agricultural, and Industrial Association (formerly North Queensland Pastoral and Agricultural Association)	J. N. Parkes	
Wallumbilla	Wallumbilla Farmers' Association	P. W. Howse ...	
Warwick ...	Eastern Downs Horticultural and Agricultural Association	J. Selke	
Wellington Point	Wellington Point Agricultural, Horticultural, and Industrial Association	F. W. Wort	21 June
Woombye ...	Woombye Fruitgrowers' Association	P. S. Hungerford ...	
Woowoonga	Woowoonga Scrub Farmers' Association ...	H. B. Griffiths ...	

AGRICULTURAL AND PASTORAL SOCIETY OF SOUTHERN QUEENSLAND.

The date for holding the Annual Show of the above society has, we are informed by the Secretary, Mr. Wilson Holliday, been changed from 30th September to 15th September. We learn that the society propose holding a Flower Show on the 29th April at Beenleigh. This should bring forward many fine exhibits, as the residents on the Albert, Logan, and in other parts of the district are in most instances owners of nice gardens. The season also has been very favourable to the growth of many descriptions of flowers, especially chrysanthemums, and dahlias, although it is almost too early for the ordinary kinds of pretty annuals like snapdragon, daisies, candytuft, cornflowers, &c., which all help to enhance the beauty and interest of a flower show.

By Authority: Edmund Gregory, Government Printer, William street Brisbane.

Plate CI.

GROUP OF CASUARINA GLAUCA.

Agriculture.

BUCKWHEAT.

By HENRY A. TARDENT,
Manager of the Biggenden Experiment Farm.

The specialisation of labour in the mechanical industries and in other branches of human activity has, of recent years, penetrated also into agriculture. There are now in various countries (especially in the United States of America) a great many farmers who think that better results can be achieved by growing one crop only on the farm, and by sticking to it through thick and thin.

Such a method of farming has no doubt its attractive sides as well as its good points to recommend it. The one-crop farmer gets more skilful in the growing and handling of his special crop; he can use for it the most improved machinery and appliances. Such farming becomes sometimes, so to say, unavoidable where there is in the neighbourhood a sugar-mill for instance, or other industrial factories requiring large quantities of a special raw product, thus affording to the farmer a sure and reliable market. There is no doubt that, at least for a time, some money is being made in that way. I will even admit that the single-crop farmer *handles* more money than the one who grows many crops. But does he put more of it into the savings bank? That is another question. Usually the whole concern ends in failure and in financial disaster.*

Soon or later the unavoidable fluctuation in prices renders the special crop unremunerative. As the farmer has to buy everything he uses and to pay in cash for it, he soon runs into debt. Being unprepared for growing and handling other crops, he usually sticks to the old one until discouragement and ruin ensue. He then abandons farming altogether or emigrates elsewhere, as do now many Victorian and South Australian single-crop wheatgrowers; others gradually revert to the old, well-tried, and proved system of mixed farming. Could the land of the farm be consulted on the subject, it would decide most emphatically in favour of mixed farming and rotation of crops. The land rebels in every way against the single-crop system. As a constant protest, it will year by year diminish its production, and will finally bear crops of so weak a constitution that they become invariably the prey of innumerable parasitic and fungoid diseases.

The above axioms are well known to all practical farmers. But the farming community, especially in this country, is not exclusively composed of practical farmers.† It recruits itself from all other trades and professions, including doctors and lawyers. These new hands at farming are usually most eager for information, and they not seldom prove to be very progressive and successful farmers. Their first question is always, "What shall I go in for in order to make a success of my farming?" And my invariable reply to them is, "Go in for mixed farming." Try to grow on the farm as many as possible of the things you require for your own and your family's use. Wherever practicable, make dairying, pig and poultry raising the basis of your farming. Perhaps there are no great fortunes in it, at least for the present. But it has an invaluable advantage—it gives a regular monthly return which will keep

* We presume that the writer does not include sugar, wheat, dairy products, coffee, rice and bananas in this comminatory clause. Queensland farmers who devote their entire energies to these products have not up to the present abandoned them, except in isolated instances.—Ed. *Q.A.J.*

† Hence the failures.—Ed. *Q.A.J.*

you out of debt. It supplies also an abundance of a most excellent and wholesome food—diminishing by so much the butcher's, baker's, grocer's, and doctor's bills. Then there is the increase of your stock, which goes on day and night, and will, with such other crops as you will be able to grow besides, help you in keeping the balance on the right side of your ledger.

Do not be afraid of over production. Science and practice have now combined. They work hand in hand, and are able to keep those products perfectly sound and fresh for long periods. They can also carry them safely to all parts of the world. In the thickly-populated countries of the old world, in its large industrial cities, in its innumerable standing armies, there are teeming millions of consumers eager to buy at a price, remunerative to the Australian farmer, unlimited quantities of the products of the dairy and piggery. Our main drawback is at present the scarcity of our farming population, which in many places is too scattered yet to combine for the purpose of starting powerful co-operative creameries, butter and cheese factories. Many factors though, of which the impending federation of the Australian colonies is one of the most important, tend and will tend daily to alleviate that drawback. The time is not far distant when we shall have increased our production in those lines to such proportions that it will really be worth while to establish an export trade on a large scale.

Then, without dispersing too much your energy and means, go in for a few crops well adapted to your land and your other circumstances. Try to combine them so that they can be grown alternately during our well marked winter and summer seasons. Make also of them a rational rotation suitable to your soil, never forgetting that a change of crop is in reality a *rest* for the land, as a change of occupation is a rest for a man. Try also to grow such crops as could be consumed—concentrated, so to say, on the farm by your stock, should there be no remunerative market for them in their raw state.

These are not mere theories. If you will think of the successful and unsuccessful farmers you know, you will find nine times out of ten that the successful farmers belong to the category of the advocates and practisers of the mixed-crop system as described above. With such farming there is no waste of energy; no time for idleness either. Every member of the family contributes his or her share to the common welfare and happiness. There is no profession perhaps more conducive to a sound healthy family life than farming thus understood and practised. Some time since the writer of these lines had the honour to be invited to a farmer's wedding in one of the principal farming districts of Queensland. The house was a comfortable and cosy nest, in a romantic site, on the bank of a running and bubbling streamlet. Everything was of exquisite cleanliness. Pictures and drawings, delicate embroideries, musical instruments showed that fine arts occupied a legitimate place in the life of the inhabitants. In front of the house there was a splendid flower garden, and lower down a well-kept fruit and vegetable garden. Both were taken care of by the womenfolk of the household, and were capable of supplying the family the whole year round with an abundant and varied vegetable diet. About fifty guests sat round the well-spread tables. Great was my surprise on learning that everything on the tables, except tea and sugar, had been grown and prepared on the farm.

The look of contentedness on the face of the old people, many of whom were the veteran pioneers of the district, the healthy and robust appearance of the young men, the graceful and happy look of the bride and her numerous girl friends all showed that this was morally and physically a healthy and happy life.

All those people have no doubt to work hard. According to God's commandment, they earned their bread by the sweat of their brows. But, taken all round, there is more happiness amongst them than is to be found in city life. The girls would certainly not exchange their work for the more trying one of the shop, bar, and factory, whose employees lead an exclusively indoor and emaciating life. For women as well as for men, animals, and plants, a certain amount of sunshine is necessary to insure their full and

complete development. Sun is eminently the source and maintenance of all animated life. Far from being a slavery—as some people call it from erroneous notions—light outdoor work is eminently suitable to women's health. Without it, the German and Swiss women, so much pitied recently by the editor of this *Journal*,* could never have give birth to the sturdy sons of William Tell or the heroes of the more recent Franco-German war, or that class of fine men on whom we must also depend here to maintain and increase the superiority of the race.

Those who have taken the trouble to follow the series of articles I have published in the *Journal* will have remarked that under a variety of subjects they all tend to the same end: to enable an increasing population to make a living on the land by means of mixed farming and the cultivation of varied crops. It is really gratifying to find how increasing is the number of farmers who fall in with the views expressed in them. Maize, millets, and sorghum, as well as pumpkins and sweet potatoes, are being regularly grown as summer crops. Cow-pea is being tried everywhere in small patches, and will ere long occupy a conspicuous position in our system of husbandry, &c. Other articles will follow on crops suitable for the winter season; but to-day it is desired to attract attention to another summer crop, which is so far very little known or cultivated in Queensland, although it should have a place on every farm.

BUCKWHEAT.

The buckwheat is not a wheat at all, not even a Graminea, as its strange English name seems to imply. The French call it *le Sarrasin*, thus showing that they attribute at least its introduction into Europe to the Saracens, with whom our ancestors used to carry on warfare during the Crusaders' expeditions. Botanists think it originated on the high plateau of Central Asia. Buckwheat belongs to the *Polygonea* family, as does also rhubarb, although it differs greatly from the latter in appearance and properties.

The ordinary Buckwheat (*Polygonum phagopyrum*) is an annual with fibrous roots and a herbaceous erect stem which rarely exceeds 2 feet in height. Its leaves, which are cordiform and acute, are rather widely spaced on the plant. The flowers, which are of a white colour, proceed from the axils of the leaves. The seeds are of a peculiar treble angular form with a white starchy kernel surrounded by a thin brown envelope. In shape they remind one of the beech-nuts of the old country, although considerably smaller. The tissues of the plant are rather aqueous and soft, which causes it to decompose rapidly when buried in the ground as green manure, a purpose for which it is well adapted.

The nectar of the flowers is considered to be excellent as bee food, especially for black bees. They open only successively for two or three weeks, which allow the bees to work on them for a long time. That point, though, is a drawback to the farmer who grows for seed, as these latter do not ripen too evenly. They shed also easily. Notwithstanding those few drawbacks, buckwheat is one of the most useful plants a farmer can grow.

When shelled by a small handmill made for the purpose, or by a very simple device which ought to be found in every flourmill, the seeds form a most excellent and wholesome food for man. It is mostly used in the form of porridge or boiled and eaten with roast meat. This is the component part of the celebrated Polish dish, the *Trazy*, one of the most exquisite things known to gastronomy. When turned into flour, it is used for pancakes and other pastries, which are both nutritious and digestible, never causing any acidity in the stomach. A sort of bread can also be made of it, but this is not to be recommended, as it does not rise so well as wheaten-flour bread.

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* We did not express any *pity* for the continental farm woman. We merely said that the British farmer does not wish to see the women of his family doing field work. We have often seen and talked with German, Swiss, and French female farm labourers, and always found them in their own country singularly happy and contented with their lot.—Ed. *Q.A.J.*

For the profitable feeding of poultry, buckwheat is hardly surpassed by any other seed grown on the farm. It seems to be, like oats, possessed of certain exciting properties which cause the hens to lay much earlier in the spring. For the same reason it is superior to corn for horses. According to comparative experiments carefully carried out, 1 bushel of buckwheat is equivalent to 2 of oats, and for feeding pigs, 8 bushels of buckwheat flour are equal to 12 of barley flour. The whole plant can also be mown down and fed as green fodder to both cattle and horses. But when dry it is reduced to a very small compass, and it does not pay to make hay of it. Buckwheat grows very rapidly, being usually ready for harvesting in about ten weeks from the time of sowing. This circumstance makes of it a capital catch-crop to sow broadcast or in drills to choke down weeds, and then to plough under before sowing the main crop.

As to soil, buckwheat is the least exacting of our cultivated plants. It will adapt itself almost to any land, but prefers granitic soil, which seems to impart a special flavour to the seeds. Nor does it seem to be very particular about climate. In Europe, it succeeds in Spain and Italy as well as in Russia, Denmark, and Sweden. Here, in Queensland, I have grown it for years in the dry West, also on the Darling Downs, and quite recently here at Biggenden. The last crop was sown on the 26th December, 1898, on newly broken forest land, and harvested on 8th March, 1899. I expected very little from it, thinking that a plant mostly grown in temperate and cold countries would not be able to bear our summer heat. Well, it stood it wonderfully well, although when quite young—on the 17th and 18th of January—the thermometer stood at 105 and 107 degrees Fahr., in the shade. Such exceptional and trying heat did not seem to affect it in the least, although

it destroyed straight away a crop of Setaria growing near by. It is our first crop on the newly started experiment farm. The returns are very fair, although the seed seems to me somewhat smaller than when grown as a spring or autumn crop. Buckwheat is very sensitive to frost, though. It should therefore be sown between September and March in all localities liable to frosts. It is usually sown broadcast, taking then about 4 pecks of seed to the acre. When possible, it is preferable to sow in drills, 1 to 2 pecks of seed being then sufficient. For small patches the Planet Junior hand seed drill, set as for spinach seeds, does very well.

I forgot to mention that in addition to the common buckwheat there are other varieties, such as the silver hulled with pink blossoms, and the Japanese of more recent introduction. This latter is the earliest, gives the largest seeds, and is on the whole the more profitable to grow.

[*Price of Buckwheat.*—There appears to be a great diversity in the price of buckwheat in Brisbane and in Sydney. The Japanese buckwheat has been sold in Brisbane for the past six years at 1s. per lb. There is, however, a new variety of Japanese which fetches 2s. per lb. here. The price for silver-auned buckwheat is 3d. per lb. in Sydney or 9s. per bushel; but Sydney is a free port, whilst in Brisbane there is a duty of 25 per cent.—Ed. *Q.A.J.*]

On the subject of buckwheat as food for poultry, the *Agricultural Gazette* of New South Wales so far back as 1892 advocated its use, and said that nothing surprised the experienced poultry-keeper more than the almost entire absence of buckwheat from the grain fed to poultry in Australia. Practically this valuable grain is out of the market, as it can only be purchased from the seedsmen in comparatively small quantities at about 10s. per bushel.

In France—the greatest poultry-keeping nation in the world—buckwheat takes the place of wheat and is considerably cheaper. It is a crop which can be grown on very light land and is easy to cultivate, although some care is needed in harvesting it, as, if it is allowed to stand too long, the seeds will fall to the ground in shoals. It is a very prolific seeding plant and hence a very small patch will yield sufficient to feed a large number of fowls. Moreover, if the seed did happen to fall, there would be no difficulty in turning the flock into the patch so that they might pick and scratch to their hearts' content.

On the Continent, and in some parts of the United States, buckwheat is largely employed for human food, and the thin cakes made of it are said to be very delicious.

Thirty bushels per acre have been shelled out at the Hawkesbury Agricultural College, grown on poor sandy soil.

Buckwheat is frequently used in gin distillation.

It is called "wheat" from the great resemblance of the flour made from it to wheaten flour. Its other designation—"buck"—may be derived from the German "Buch" (Beech), on account of the shape of the seeds being somewhat similar to the triangular seeds of the beech-tree.

There are three known species cultivated for their seeds—viz., the common buckwheat, the Tartarian, and the notch-seeded buckwheat.

The inducements to grow it are the late season at which it may be sown, its cheap cultivation, its full growth on the poorest soils without manure, and its being an alternative crop to all others. The poorest gravelly and sandy soils will carry it if drained, but it will not thrive on clay. The crop will reach 40 bushels per acre, of 48 lb. to the bushel, under favourable circumstances. Its value is the same as that of good barley.

THE POTATO.

BY W. SOUTTER.

So far back as 1535, when the Spaniards invaded South America, they found the cultivation of the potato there a matter of ancient history. Its advent into England dates from between 1580 and 1585, it being conveyed thither by Sir Walter Raleigh or Thomas Herriott on their return from a voyage to Virginia. The exact location of the spot where these voyagers found the tuber is partly veiled in obscurity, and on its being demonstrated that the tuber could be successfully grown in the British Isles there was an outcry against its use; even the pulpit condemned it as being an unholy article of diet, seeing the race and place from which it originated. To Dr. Buchan, in 1805, and Sir John Methuen is due, in a great measure, the popularising of the potato in England. It will therefore be seen that nearly 220 years elapsed between the date of its introduction and the time when the floury tuber became by any means popular.

Speaking broadly of the potato, it may be said to contain chemically starch, gluten, and woody fibre, with, of course, water. On the authority of the late John Wilson, Professor of Agriculture, Edinburgh, an 8-ton crop of potatoes taken from an acre of land, removes from the soil in which they were grown—of the bases of alkaline earths, 90 lb. of potash, 8 lb. of soda, 5 lb. of lime, 7 lb. of magnesia; and of acids, 34 lb. of sulphuric acid, 20 lb. of phosphoric acid, 10 lb. of hydrochloric acid—in all, 174 lb. of inorganic matter. This was for tubers alone; and if an equal quantity were allowed for the tops, the quantity taken from the soil would be about doubled.

It is therefore evident that to grow potatoes to perfection the foregoing constituent elements must be present in the soil. Professor Wilson, in a series of very interesting experiments carried out by him, found the best results to be attained by preparing the soil early and applying phosphatic and potash manures, some time before planting, in the proportion of about 150 lb. to the acre. And at the time of planting, nitrate of soda is sown in the drills at the rate of 1 cwt. per acre, and from ½ to ¾ cwt. at earthing-up time.

On light, poor, sandy soils, nitrogenous manures in the form of sulphate of ammonia should be supplied at the rate of from 140 lb. to 170 lb. to the acre, one-half to be used at the time of planting, and the other half at the final earthing up.

The matter of farmyard manures in growing potatoes is a somewhat vexed question. Farmyard manure is good, provided it has been properly fermented and well decomposed; but there is nothing more fatal to good results with potatoes than putting fresh manure and potato sets together,* for the young plant can never force its way through the fermenting mass of decay, consequent upon the slow decomposition.

Perhaps the best soils to grow potatoes in are those into the composition of which decomposed granite enters, or on alluvium. Some of our scrub soils yield a fairly good crop of tubers, but they are usually very watery and bad keepers, while there is frequently an abnormal growth of tops. As regards planting, it is usual in Queensland to plant on the level—that is, behind the ordinary plough. Why not follow the old plan of action adopted by the British farmer? Many a crop of potatoes would be saved which otherwise must perish by the excess of moisture were the same methods adopted in the colony. It is seldom that one sees a double mould-board plough; yet one of these implements is essential for making perfect potato furrows.

[The history of the potato affords a strong illustration of the influence of authority. For more than two centuries, as stated by Mr. Soutter, the use of this invaluable plant was vehemently opposed, especially in France. A

* This was very clearly shown by an experiment which we ourselves made some years ago. The potato sets were planted in furrows on stable manure. The haulms were luxuriant when they grew, which was only here and there, most of the sets having rotted; but as for potatoes, the result was *nil*.—Ed. *Q.A.J.*

gardener of advanced ideas planted an acre of potatoes in his garden in the environs of Paris in the time of Louis XV., in the year 1743. He could not induce anyone to purchase the unholy tuber. At last, in despair, he sought an interview with the king, and induced him to appear at a ball in the midst of his courtiers wearing a bunch of potato flowers. Then fashion came to his aid. The flowers were sold at exorbitant prices, and the consumption of the root became universal in France.—Ed. *Q.A.J.*]

MARKET GARDENING.

No. 4.

BY H. W. GORRIE,
Horticulturist, Queensland Agricultural College.

PEAS.

THE Pea (*Pisam sativum*) is an annual plant indigenous to Western Asia, Persia, and Northern India.

This vegetable has been cultivated in Europe from a very remote period, seeds of peas having been found among relics of the bronze and stone ages.

When the pea was first cultivated in England is not known, but we have records of it in the 13th century. The peas which are grown at the present day are so much improved by cultivation and selection that it is almost impossible to believe that they are the same species known 100 years ago. There are two distinct forms of peas now in general cultivation—namely, round and wrinkled.

These again may be either dwarf, medium, or tall. The wrinkled varieties are usually the earliest to come into bearing, generally the most productive; and, as a rule, remain longer in bearing than the smooth or round kinds.

Peas may be grown in many different kinds of soil, but a rich, light, sandy loam is perhaps the best. If manure is used, it should be well decomposed, and thoroughly worked into the ground.

The time for sowing here is from January to September, sowing enough once a fortnight or so to keep up a constant succession. The dwarf varieties should be sown in rows not less than 3 feet apart, and the tall-growing kinds about 5 feet; a good plan is to plant the rows of tall peas 8 or 9 feet apart, and grow two or three rows of cabbages or other vegetables between. By this plan the sunshine and air have free access to all the rows of peas, which would not be the case if they were so close as to partly overshadow each other.

A common mistake in sowing peas is planting them too thickly. The seeds should be dropped into the drills from 3 to 4 inches apart, and the drills should be from 2 to 3 inches deep. In moist weather 1½ or 2 inches is deep enough; but in very dry weather it is advisable to sow a little deeper in order to get the benefit of the moisture in the soil. Peas are very often sown in double rows, 6 inches apart, and the seeds at intervals of 6 inches in the rows. By this system a good crop can be obtained, and also ground economised where the latter is valuable or of limited area.

The tall varieties require some kind of support, such as brushwood or sticks, or, better still, wire netting, which can be placed over the rows, supported on stakes, the lower side of the netting being about 10 inches above the ground.

In dry weather, frequent cultivation is necessary, and an occasional watering will also be beneficial; if liquid manure is procurable, so much the better for the crop.

Very fine peas are sometimes grown by sowing them in a furrow 6 inches deep, only partially filling in the furrow at first, and gradually filling it up as the plants grow.

Good varieties to grow here are McLean's Little Gem, Stratagem, Yorkshire Hero, American Wonder, Pride of the Market, and Sir Henry Atkinson.

None of these are very tall-growing kinds, and they can be grown without staking or trellising; but it may as well be borne in mind that even the dwarf varieties (with the exception of the very small ones) will yield better crops, and be much easier to pick, if trellised than if left on the ground unsupported.

BEANS.

Beans for gardening purposes comprise French or kidney beans, pole beans of various kinds, broad beans, and Lima beans.

All these are annuals except the Limas, which are perennials where the winter is not too cold, although in the Southern part of the colony they may for all practical purposes be considered as annuals. French or kidney beans (*Phaseolus vulgaris*) can be grown nearly all the year round in many parts of Queensland, but where winter frosts prevail the season may be reckoned from the middle or end of August until April or May. During these months, successive sowings may be made at intervals of two or three weeks when the ground is not too dry. Any good garden soil will grow French beans, but the best crops are obtained from good loams or alluvial soils.

The drills should be a few inches deep, the depth varying from 2 to 4 inches according to the weather and the state of the soil.

The rows should be about 3 feet apart, and the seeds at least 6 inches apart in the rows.

If the soil is very dry, the drill should be watered well before sowing.

The beans should be gathered as they become fit—that is, while young and tender; and unless it is desired to save some for seed they should not be allowed to ripen, as thereby the bearing power of the plants will be considerably lessened.

Pole or runner beans are summer plants, and may be sown from September to February or March. The rows for these should be 4 or 5 feet apart, and before planting poles about 6 feet long should be set up along the rows at a distance of 3 or 4 feet apart. Around each pole plant 6 or 8 seeds 2 inches deep, and when they come up thin them out, leaving 4 of the strongest plants to each pole. It may sometimes be necessary to tie the young tendrils to the poles at first, but as soon as they begin to run they will twine around the sticks naturally without any artificial help.

Broad beans do not succeed well in the hot weather, their season being from March to August or September. Sow in drills 3 or 4 feet apart, 3 inches or so deep, and the beans about 9 inches apart in the rows.

When the plants come into flower, their tops should be pinched off in order to check the upward growth of the plants and cause the beans to set. If this pinching is neglected, in all probability the plants will continue to grow, most of the flowers will drop off, and there will be little or no crop. The beans should be gathered as they become fit, whether they are wanted or not, so as to prolong the bearing season as much as possible.

Lima beans are a good crop to grow in the summer months, as they will stand any amount of heat and dry weather, and continue in bearing for a very long time. The Dwarf or Bush Limas are perhaps the best to grow, as they require no poles, and consequently give less trouble. Lima beans, both dwarf and pole varieties, may be planted in August or September and again in November, and will continue to grow and bear until cut down by the frosts in winter. Dwarf Limas may be planted in drills 3 feet apart, and the seeds 18 inches apart in the rows or in hills of 4 or 5 seeds 3 feet apart each way. The seeds should not be planted more than 2 inches deep, and should be placed in the ground edgewise with the eyes down.

The pole Limas require precisely the same treatment as other pole beans. It is hardly necessary to state that the French beans and most of the pole beans are *pod* beans, of which the edible part is the young tender seed-pod. Broad and Lima beans, on the other hand, are *shell* beans—the part used for food being the bean itself, and not the pod.

Plate CII.

FIELD OF ARROWROOT, Six Months Old.

All of these, except the Limas, must be used when young and tender. The Lima beans may either be used green or allowed to ripen and stored for use in winter. They will keep for a long time, and only require soaking in water before cooking, to render them soft and palatable. Lima beans should be more extensively cultivated than they are, because they will succeed in dry seasons when other beans fail, and continue to bear right through the summer.

The varieties of French beans (including so-called Butter beans) are legion, and each grower must choose the kind best suited to his requirements.

Of the Limas, Burpee's Bush Lima is a very good kind. The beans of this variety are considerably larger than most of the other Limas, and are also very tender and palatable.

ARROWROOT.

By A. J. BOYD.

Nearly 40 years have elapsed since arrowroot was first manufactured on a commercial scale in Queensland, and the Messrs. Grimes undoubtedly can claim to be the fathers of the industry. In the early sixties they grew a considerable quantity of arrowroot both on Oxley Creek and on the Brisbane River, and, later, on the Coomera River, where they erected machinery for the manipulation of the bulbs. Two kinds were grown—the Bermuda, or *Maranta arundinacea;* and the large purple variety, *Canna edulis*. These differ materially from each other both in habit of growth and in size, shape, and colour of the bulbs.

The Bermuda plant is diminutive, rarely attaining a greater height than between 2 and 3 feet. The blossom is white, and the tubers, which cluster round the roots, are also white, with a thin skin, and bare of rootlets. They adhere to the roots of the plants much in the same manner as potatoes, and are not very numerous.

The purple variety, or *Canna edulis*, grows to a great height, often rising to 8 or 9 feet. It has very large broad, ribbed leaves, and as many as fifteen and twenty stalks rise from a single stool, each stalk representing a large bulb. In the flowering season the plant sends up a long straight spike, from the head of which bursts a beautiful bunch of bright scarlet flowers, having the appearance of those of the *Canna* known as Indian Shot, so generally seen in our gardens. The seeds do not often mature, however, as do those of the *Canna* family generally. The bulbs from which the arrowroot of commerce is prepared, form a compact mass on the surface of the ground, and so prolific is the plant that as much as 60 and even 80 lb. weight of bulbs have been dug from a single stool.

Our illustration represents a well-grown field on the Pimpama River (which is now the principal seat of the industry), the property of Messrs. Lahey Bros., who have here an extensive manufacturing plant, where also cornflour is prepared.

It does not follow that because there are only one or two principal centres of manufacture in Queensland that, therefore, the plant will thrive only in those localities. On the contrary, it grows luxuriantly on all the coast lands from the Tweed in the far south to Cooktown in the far north. It prefers the rich alluvial scrub lands on the river and creek banks, but does very well also on the rich deep soils of open country. The Bermuda arrowroot prefers a more sandy, loamy soil. The writer grew both varieties at Oxley on the newly cleared scrub land bordering on that creek, and found that the former did not thrive well on the rich soil, many plants producing only two or three tubers 6 or 7 inches long and about 1 inch in diameter. The purple *Canna*, on the contrary, grew most luxuriantly and produced an enormous number of bulbs, which usually found their way to the Messrs. Grimes' mill on the Brisbane River. The price of

bulbs at that time was £2 10s. per ton, and the manufactured product could be readily sold in the colony at from 9d. to 1s. per lb. The difficulties of transport amongst the scrub farms of those early years were very great, and for a long time boats were the sole conveyance possessed by the farmers on the Brisbane River and its tributaries. On one occasion the writer was towing a boat laden with 5 tons of arrowroot bulbs out of the creek. On reaching the river the craft gave signs of extensive leakage, as she was loaded almost to the gunwale. There was just time to pull across to a sandbank on the opposite side when she sank in 2 feet of water. The whole cargo had to be taken out, the boat was patched up and reloaded; but on reaching the wharf to which she was bound, she once more disappeared, and the cargo had to be recovered by diving.

CULTIVATION.

In newly burnt-off scrub land, of course the stumps occupy so much of the surface as to preclude any ploughing. It then becomes necessary to dig holes with a sharp mattock or hoe which will cut the roots with which the ground is matted. The holes will be about 6 feet apart; 7 feet would be quite sufficient for the width between the rows, and 4 feet 6 inches between the holes, but, owing to the presence of the stumps, very little regularity can be observed, and the planter must do the best he can. On open, cleared land, where the plough can be used, the proper distances can be observed. The land should be thoroughly well ploughed and harrowed and pulverised. Then shallow drills are drawn with the plough about 6 inches deep, and at the regulation distance of 4 feet 6 inches apart single small bulbs are dropped and covered by turning a furrow over them on each side. On new land the best results have been obtained by placing the rows 8 feet apart. As the land becomes poorer the rows may be closer together, but should not be of a less width than 6 feet. We saw a field at Pimpama, of which we give an illustration, in which the rows were 6 feet apart, yet in the month of April the plants had spread to such an extent that it was difficult to walk between them. When the plants are above ground they must be kept clean as in the case of other crops, and by the time they are about 3 feet high they will want no further cultivation beyond throwing up a furrow against the roots—hilling up, in fact. From this time the heavy foliage will have covered the ground, effectually preventing the growth of weeds. The planting season extends from August, after the last frosts, to the end of January. The crop should be ready to dig in July, as soon as one or two frosts have touched the plants, and the manufacture should go on until the end of October. If the work is protracted into the spring months, the bulbs begin to shoot, and the yield of starch is consequently lessened in quantity and deficient in quality.

PREPARATION OF THE BULBS.

When the bulbs have come to maturity—that is, in about 9 months after planting—and when the plants, as stated above, have had a touch of frost, then is the time to commence the harvest. It may be well to repeat here the remarks made by Mr. D. Lahey, of Pimpama Grange, on the subject of "When to Harvest Arrowroot," which were published in Vol. II., Part 6, of the *Journal* for 1898.

A good test for ascertaining when arrowroot is ready for digging is the following:—

Observe the outer leaf of the bulb. A triangular slit will be noticed pointing downwards. If the slit appears white, the bulb is still immature, but as soon as it turns purple the crop may be harvested. Arrowroot may be left to stand over for two seasons, as in the case of sugar-cane.

This latter statement is important, for it has happened that in one or two cases last year, when the crop was larger than the available mill-power was

capable of dealing with, the growers turned their cattle into the field. Had the crop been held over, it might have been possible to get it in during the next season, and thus avoid a great deal of extra labour.

To come back to the preparation of the bulbs for the mill: The stalks are first cut down with a handy implement such as a sharp hoe, cane knife, or reaping-hook. The stool is then dug up with a strong mattock or a stout-eyed No. 3 grubbing-hoe. A spade or fork is quite useless for the work, as the stool has a strong hold of the ground, in addition to which the bulbs of *Canna edulis* cling firmly together by the masses of rootlets proceeding from each bulb. The bulbs must be separated, and all earth adhering to them must be knocked off. As soon as dug, they must be carted to the mill; therefore it is well not to take up more than can be operated on each day. Every day of exposure to the weather or to the hot sun has an injurious effect upon the colour of the manufactured starch.

MACHINERY.

The average return of a good crop will be about 30 cwt. of starch or ten times the quantity in tons of bulbs. From 12 to 40 tons per acre have been dug from a field in which the plants were set at distances of 5 feet between the plants in rows 6 feet apart.

It goes without saying that the yield will vary according to soil, locality, season, good or bad cultivation, and proper washing, grinding, and drying appliances; but as a general rule the yield of starch may be set down at from 15 cwt. to 30 cwt. per acre, although as much as 4 tons per acre of finished arrowroot has been obtained under exceptional circumstances.

The machinery employed in the manufacture, in the very early days of agriculture in the colony, was as primitive as that used by the ancient Britons for pounding grain, or by the Australian natives for crushing the seeds of Nardoo, with the differences that the small arrowroot grower made use of a grater made by punching holes with a nail in a piece of kerosine tin. Gradually improvement crept in until a hand-machine was constructed by the writer which much accelerated the work, but was still only a makeshift. This machine is illustrated in the *Journal* (vol. I. p. 202).

Since that date modern machinery has been introduced capable of turning out from 10 cwt. to 30 cwt. of arrowroot per day.

In addition to a 6 horse-power engine, there are root-washers, grinding mills, cylinders, sieves for separating the starch from the pulp, and centrifugals for drying. To be more accurate, the requirements for an arrowroot mill capable of turning out 30 cwt. daily are: Engine of from 6 horse-power to 10 horse-power, carrier, rootwasher, elevator, grater or grinding mill, rotary sieves, shaker sieves (2), chute, patent circuitous trough (for which Mr. Lahey has obtained a patent) with agitators and sieves, centrifugal for draining, tables and calico for drying.

The whole of the work, after the roots have been raised to the highest point of the building, is effected by gravitation. The roots, as they come from the field are tipped from the drays on to the carrier, whence they are carried to the root-washing trough. Running through the centre of this is a spindle with pegs inserted diagonally into it, of sufficient length to clear the bottom and sides of the trough by about 1 inch. Here the bulbs are thoroughly cleansed of all dirt, stones, &c., and they are then passed on to the grater, a large wooden cylinder covered with perforated iron, burred, on to which the bulbs drop from a hopper. A stream of water pours continuously upon this from above, and the pulp and starch held in suspension pass on to a shaking sieve. From this the farina and water pass to a second sieve, the pulp being ejected on the other side of the first sieve. On leaving this sieve, which is perforated with very fine holes, the water and farina are shot into a large trough, where the latter soon settles at the bottom. When a sufficient quantity for the day's work has passed into the trough, it is allowed to settle firmly, and the water is gradually drawn

off through a series of taps till the farina is left in a solid mass at the bottom. Now it will be seen that the surface is covered with a dirty slime. This is washed off and is put away for pig food, a certain amount of farina going with it. Water is then again admitted, the farina is stirred up with it, and it passes then through a fine silk sieve into the next trough, leaving the first one clear for the following day's work. After further skimming and washing, the now almost clean product passes into the circular trough, which runs right round the building. In this there is an agitator, like the paddlewheel of a steamer, which revolves and thoroughly stirs up the whole mass. When the agitation has proceeded for some time, the farina is once more allowed to settle, and a final superficial washing of the mass takes place. This process does away with all hand-washing. In fact, from the time the bulbs are emptied from the drays on to the carriers, they are not handled in any way, except to cut off any stalks which may not have been cut off close enough. The farina is finally dug from the circuitous trough, passed through the centrifugal to extract all possible moisture, and is then taken to the drying ground, where it is exposed to the sun on frames covered with calico. Should a shower of rain fall on it whilst it is drying, the rainwater has the singular effect of turning the farina brown, when it has to be rewashed. After drying it is bagged and put up for export.

Most mills are constructed on the same plan, and the process is practically the same in all.

There are in the Pimpama district, seven steam mills in operation, of a capacity of from 10 cwt. to 30 cwt. of farina per day, and two more mills are in process of erection. On the Coomera, the Messrs. Grimes have an extensive plant and cultivate largely. Hand and horse mills are never employed.

The average yield of farina per acre may be set down at from 1 to 2 tons, and the price in Brisbane ranges from £12 to £20 per ton, or an average say of £15 per ton. Firewood is a considerable item of expense, as it requires about a cord of wood for each ton of roots. Shipments of arrowroot sent to London have been sold as low as 1¾d. per lb., or £16 per ton; freight amounting to about ¼d. per lb. The cost of erecting a mill such as I have described would reach about £1,200, with an additional £200 for necessary drying and storing sheds. Where cornflour is made, the expense of the mill is much greater, in fact it may reach over £4,000. At Mr. Lahey's mill cornflour is made, and the process is much akin to the manufacture of arrowroot.

The corn (maize) is first steeped in hot water, and is then ground between large millstones, after which it passes through sieves into huge vats, where it settles and the gluten remains on the surface. This gluten, however, cannot be washed off without the aid of chemicals.

[I had intended to give some illustrations of an arrowroot mill with this article, but must defer them until the busy season comes round, when the mills will be in full working order.]

There are, in the Pimpama district, which includes Ormeau, about 330 acres under arrowroot. In 1898 there were 335 acres. The great obstacle to the extension of the industry is the want of a large market. If that could be obtained, then there would be no better or less expensive crop for the farmer. Once the bulbs are planted, they give little trouble beyond keeping them clean for the first 3 months, after which nothing more is required until harvest time.

It seems a pity that no use can be found for the enormous mass of stalk and foliage produced. Some planters plough the stalks in, when they act both as manure and as drains. There are few prettier sights on the farm than a field of well-grown arrowroot in full bloom.

Mr. H. V. Jackson, Manager of the Wollongbar Experiment Farm, New South Wales, in an article in the New South Wales *Agricultural Gazette*, quotes a letter from Messrs. Robert Harper and Co., on the subject of arrowroot samples made from tubers grown at Wollongbar. Those gentlemen say:—"Replying to your favour of 7th instant, regarding arrowroot, in speaking of the "prepared article" in our last letter, we meant the prepared

article loose in sacks, not put up in ½-lb. or 1-lb. packets. The sample tin of arrowroot you have sent us has been received, and we have examined same. It is very good quality, but when made, the colour is not nearly so white as the Queensland, with which it would have to compete. The fault lies in the washing, which has not been thoroughly done. We estimate the market value of arrowroot the same as your sample about £14 per ton, delivered in Sydney. We are sending you a sample of the best Queensland arrowroot, and if you take this sample, also yours, and compare the two, you will at once notice the better quality of the Queensland."

THE VALUE OF MANURE.

By S. C. VOLLER

A word of advice will not be out of place for many of our settlers on the coast country who, in conjunction with farming and dairying, are growing more or less of citrus fruits. The advice is that they take more care than is now done in many cases in the matter of saving the manure and other material kicking about their establishments, and which will prove of very great value if used on their orchards.

We have a good many thrifty and careful folk among our settlers, who make the best of the conditions under which they have to live and work; but we also have a number who, for want of a little system, and, perhaps, for want of a little more energy also, lose far more than they are aware of in the way of results.

Time after time in travelling about the country do we see places where what might be a paying patch of trees is just an eyesore—ill-kept, half-starved, languishing.

There is no reason why farming and dairying, as carried on in many places, should not dovetail in very nicely with a bit of fruit-growing, and pay all the better for it. The settler generally has all the implements and horses at work in the one line that are required for cultivation in the other, and the prospect of a good return from the trees should at once settle the question of devoting the necessary time to the work. As it is, many are doing it, but often in such a way as to attain poor results and little satisfaction.

But, granted that the ordinary cultivation is fairly well attended to and that the trees are bearing, how are they to keep on giving the best returns without proper support? and then the question comes as to how the supply of nourishment is to be obtained. Not every settler can afford to buy expensive manures, although under certain circumstances, and under proper management, it pays to do that; but every settler can make use of what he has about him, and this is what we want to get at. If the farmer has a herd of milkers—even only a few—by a liberal use of the rough grass, which is nearly always obtainable, he can make these cows all the more comfortable with a good bed, and gain enormously in the growth of his stock of manure.

In the matter of manure alone it will be found to pay to give every cow and horse a stall to itself with plenty of bedding, constantly cleaned out and renewed. The pigs again help by being supplied with corn husks, rubbish, and litter off the farm, too often burnt to get rid of it. Corn stalks, cane trash, and a heap of other stuff can be either put through as bedding or brought in and worked into a compost heap. It is not good enough to gather now and then a few barrow loads of sundried manure, tip it under an orange tree, and then expect that tree to come up smiling with a good crop. Even good manure will prove of little value applied that way, as the weather simply takes all the good out of it. The better way is, after saving all that can possibly be utilised in the manure heap, and having your land in clean order, to put the manure evenly over the surface, and turn it in lightly. Let the trees be fed regularly in this way and kept free from scale pests, and our farmer will find

that this part of his establishment will probably pay better than anything else he has got. Another point worth remembering, either in connection with ordinary farming or fruit-growing, is this, that the manure carefully saved about a place enables a man to get from 5 acres what he probably would not get from 10 otherwise. It pays to save up in this way, and the man who does not do it may be working very hard with one hand and wasting with the other. Another thing worthy of attention is the fact that manure heaps frequently get over-heated and dry. When this state of things threatens, just tip a few barrels of water into it, and after a little time turn the whole heap. Any settler who happens to be within reach of a slaughter-yard should get as much of the blood as he can, and work that into the heap. The results in the value of the manure will be found to be surprisingly good.

THE PROFITS OF WHEAT FARMING IN CANADA.

THE main factor to be remembered is that it costs about $5, or £1, to bring an acre of wheat to perfection. Whether the crop is poor or heavy, the cost of cultivation is almost identical. Ten bushels, with wheat at half-a-dollar, or 2s., repays the cost: everything beyond this is profit; everything below it is loss. The man who starts with a 160-acre lot on any of the estimates of first cost which have been given will either at once or in the following year exercise a right which is granted by the Government to pre-empt another quarter section of 160 acres adjoining his own, for which in the course of ten years he will have to pay at the rate of 10s. an acre or 1s. an acre per year. With a farm of 320 acres he should by the end of his fourth year of occupation have 200 acres under crop, and, allowing 100 acres for summer fallow, should never fall below this acreage for profit. The value must be calculated according to weight of crop and price of wheat, but in estimating the difference between the net profit of English farming and farming on the Canadian prairies it is not in these points that it will be found.

As will have been observed in the estimate of crop given in a previous letter, the average yield of the good prairie farm is not higher than that of good English land. It is hardly so high. The difference between a good prospect of prosperity in the one case and too frequent failure in the other would appear to be traceable mainly to three causes. The first of these is the difference in the capital value of the land, which dispenses with the necessity for a return in the form of either rent or interest; the second is the much cheaper production of the prairies, rendered possible by the system of working with improved machinery and the absence of any necessity for manuring the soil; the third is the greater facility for disposing of his crop which is given to the Canadian farmer by the commercial system of handling grain through the medium of local elevators. Thus, a man who possesses only £120 of capital can secure a freehold of 320 acres, with a prospect of keeping 200 acres continuously under crop. He will not expect a higher average yield than 30 bushels an acre. The yield may even be something less; but, instead of costing from £3 to £4 an acre to cultivate, it will cost him £1 an acre, and what he has produced can be sold without difficulty at his door. The time and expense involved in dealing with outside markets are spared to him. He nets his return, if he so pleases, on the day on which he reaps his harvest. With a crop of 30 bushels an acre—and this, it may be remembered, was the average of the whole of the Indian Head and other well-farmed districts this year—he may realise, at the low price of 2s. a bushel, a net profit of £2 an acre, or £400 a year. With wheat at 4s. a bushel, as it was last year, he may more than double this return. Five bushels will then be enough to pay his cost of production, and 25 bushels are left for net profit. Twenty-five bushels at 4s. represent £5 an acre, which multiplied by 200 acres is £1,000. A relatively small return per acre, when multiplied by hundreds and not subject to deduction

for rent, will give a comfortable yearly surplus; and to these conditions must be added the further fact that the chances of accumulation in early years are greatly increased by the general simplicity of the scale of living in a new country. The rule of domestic economy on the prairies is to buy nothing which it is possible to make or grow. The cost of living for a small household is practically included in the cost of production, and everything which is realised beyond that is profit.

The estimates of the capital required for making a fair start are given subject to two remarks. One is that to start a very young man on any much larger scale is to incur an almost certain risk of loss; to become a proficient in prairie farming it appears to be almost essential to pass through an apprenticeship of "roughing it," and any extension of the scale of investments which may be desired should be made at a later period. The other remark is that many a successful beginning has been made upon much smaller sums. Both in ranching and in wheat-farming beginnings have been made by men who, working for wages, have patiently invested their earnings year by year in cattle or in farm machinery till they have accumulated a small stock with which to start upon an independent career. The great advantage which the possession of even a little capital confers is that it saves time in the early years of a man's career and places him much sooner on the road to independence.

It will be observed that the difference between the higher and the lower estimates which have been given is caused chiefly by the different amounts which have been allowed for the purchase of farm machinery and cattle. It is a matter of absolute necessity for successful farming on the prairies that a man should have the use of machinery. It is not, however, essential during the first year or two that he should own it. A press-drill seeder will sow 10 acres of land in a day. In the first year, in which there are but 20 acres to sow, the seeder will only be in use for two days, and might be hired for the occasion. The same argument applies to the reaper and binder, which will also reap and bind the crop of 10 acres in a day. These and other items may therefore be retrenched from the first outlay. On the other hand, the young settler who owns horses and a seeder, and has only two days' work to do on his own land, can profitably hire himself and his machine out to more busily pressed farmers from 2 dollars 50 cents to 3 dollars a day, repeating the process at harvest time with his reaper and binder, and earn a handsome interest on the first cost of his machines.—*Weekly News Advertiser.*

Bush Work.

CLEARING HEAVY TIMBER.

Some considerable interest appears to have been aroused by our description in the *Journal* of a method of getting rid of heavy timber on land intended for cultivation by means of inoculation with saltpetre supplemented by ringbarking. A correspondent who considers the matter of great importance to settlers on the North Coast line wishes for further particulars concerning this process. It is certainly not new, having been advocated years ago by a correspondent of the *Queenslander*. The amount of saltpetre required for a tree 3 feet in diameter is stated by Mr. P. Mac Mahon, Curator of the Botanic Gardens, as being regulated merely by the size of the tree and the diameter of the auger employed. He recommends that only one hole should be bored with an inch auger to a depth not beyond the solid wood. If the tree be perfectly solid, then the hole should be bored to the centre and be filled with the salt. The time elapsing between the first and second charging can, of course, be determined by examination. It will probably be nearly a year. If the operator,

on sounding the hole some time after the first charging, finds that the salt has been absorbed, he then recharges, and when the second lot is absorbed he must ringbark the tree and wait until it dies before firing. In the case of a hollow tree, as before stated, the hole should only be bored into the solid wood, otherwise the effect will be lost, as the salt will pass into the hollow instead of being carried to the extremities of the limbs and roots by the circulation of the sap.

With large hollow stumps, Mr. Mac Mahon advises that the hollow be filled with saltpetre, and then covered with a slab or sheet of bark. When the whole of the salt has disappeared, the stump when fired will burn out to the extremity of the longest roots. Mr. Mac Mahon, however, prefers the use of dynamite, as being more expeditious. Where time is of no importance, the saltpetre method has decided advantages.

Our correspondent states that he wishes to get rid of heavy hardwoods. We, of course, do not know how far from the North Coast Railway line his land is situated, nor what kind of roads exist leading inland from Pinbarren Siding, but we might suggest that good sound hardwood—putting white gum out of the question—should rather be protected than destroyed. A few hundred acres of timber suitable for the sawmill are a good legacy to leave to the future generation, especially so near to Gympie and Brisbane. We would ask our correspondent to study our articles on "Forest Conservancy" before doing away with timber which will require several generations to reproduce.

Dairying.

RIPENING OF CHEESE.

BUTTER is at its best, so far as food purposes are concerned, immediately it is made, while with cheese the case is much different. When the manufacture of cheese has been completed, it is still an unpalatable product, and one that is unsuitable for human use. Before it should be used as food it must be changed materially from a physical as well as from a chemical point of view. These changes are controlled in large parts by the action of biological forces, and while our knowledge concerning them is still far from being complete, yet enough is now determined to justify a consideration of the same from our present standpoint.

During the last year Dr. S. M. Babcock and the writer (H. L. Russell, Professor of Bacteriology, Wisconsin College of Agriculture) were able to show that the generally accepted theory, that the ripening or curing of cheese was produced solely by the action of bacterial forces, was erroneous. As a result of this work, it is our belief that the ripening of cheese is a twofold problem that may be divided in the following way:—First, there is the breaking down, or the peptonisation of the green curd into the ripened cheese, and, second, there is a gradual development of the peculiar flavours that characterise the various kinds of cheese. These two phases of the problem are quite distinct, and must be investigated in a different way. Furthermore, we have found that the breaking down of the casein is produced, not by the action of bacteria in the cheese, but by the presence of certain peculiar chemical ferments, known as enzymes, that are inherent in the milk itself, and which are produced directly by the animal, and not by the operation of bacterial changes in the milk. The ferment causing this decomposition of the casein is called *galactase*, and so far as our researches have been made with the milk of different species of animals, including the human, we have found this unorganised ferment present in all milk.

The action of this chemical ferment can best be understood if we compare it with that of other well-known ferments, like pepsin and trypsin of the stomach and pancreas, that are concerned in the digestion of food. This milk ferment is more closely related to trypsin, the digestive ferment of the pancreas, inasmuch as it acts more rapidly in neutral solutions, and is quickly affected by the presence of free acids. These ferments that dissolve proteid substances, such as white of an egg, lean part of meats, casein of milk, are intimately concerned in preparing the food so that it can be absorbed and assimilated by the tissues of the body. While these chemical ferments are not alive, and therefore incapable of reproduction, still they possess many characteristics that ally them to living substances. Their action is retarded by cold, and if the temperature exceeds a certain point their activity ceases entirely.

This explains why a variation in temperature exerts such a marked effect on the rate of ripening of the cheese. If cheese is cured at relatively low temperatures, the digestive change, due to the ferment, is very much retarded, whereas an increase in temperature, that would occur under ordinary conditions, hastens very much the course of these changes. If cheese could be kept at a temperature of 160 degrees to 170 degrees Fahr. without injuring its texture, we would find that the ripening or "breaking down" would be inhibited, because the milk ferment would be destroyed under these conditions.

The production of the peculiar flavours that characterise the different kinds of cheese is undoubtedly due to the action of bacterial causes, at least, in part. But our knowledge concerning the details of this action is yet so vague that it would be presumption to forecast what future investigation will disclose. In a number of cases, however, the production of the peculiar flavours is so directly associated with the development of living organisms that the relation may already be said to be securely established.

This is seen particularly in the case of the mouldy cheese, such as the Roquefort of France, the Stilton of England, and Gorgonzola of Italy. These cheeses obtain, in large part, their characteristic flavours on account of the presence of various moulds that develop in their interior. Thus the ordinary green mould that is so common on bread and other substances that are kept in a moist atmosphere, gives to some of these cheeses the delicate and peculiar flavour for which they are so highly prized. These moulds do not belong to the bacteria, but are fungi. They are, nevertheless, living ferments, and therefore we may say that the production of these flavours is due to biological causes.

The manufacture of these different varieties of cheese has grown up entirely as the result of empirical knowledge, but it is curious to see how cheesemakers unwittingly employ means that are precursors of modern bacteriological methods in their work. For instance, in the Roquefort cheese, in order to thoroughly incorporate the desired mould into the substance of the cheese itself, the maker takes a lot of bread that has been most carefully allowed to mould, and mixes this with his curd, so that the mould germs are introduced throughout the whole mass of the cheese. This is a rough species of inoculation. By experience he has also found that the mould sometimes does not develop luxuriantly, and, in order to induce copious growth of the fungus, some of these mouldy cheeses are pricked with needles that penetrate the cheeses to a considerable distance. This allows the air to enter, and in these minute orifices the threads of the mould fungus can spread more thoroughly.

MILK-TESTING.

The old system of buying milk by the gallon, regardless of its richness in butter fat, has of late years been almost entirely superseded in butter factories and creameries by paying each supplier a price which is regulated by the percentage of butter fat contained in the milk delivered by him. This method at once does away with any temptation to dishonest dairy-farmers to water their milk, and at the

present time butter factories are free from all trouble in this respect. This development in modern dairying is due to the invention by Dr. S. M. Babcock, in 1890, of a rapid, accurate, and inexpensive method of determing the amount of butter fat in milk; and his machines, which have been proved by careful comparison with accurately made chemical tests to give exceedingly correct results, are used throughout Australia for this purpose at the present day.

The results of this universal system of milk-testing show that from time to time, and from no apparent cause, the milk given by any one particular herd is liable to vary in its richness. This unexplainable fact has, in some instances, given rise to doubts on the part of dairy farmers as to whether the weekly tests at the factory are to be relied upon, and whether by the present system of testing that justice is done to their milk which they were led to expect, and felt justly entitled to receive. This feeling of doubt has, in many instances, been accentuated by the great discrepancy between the results obtained in the show-yard and those given by the factory to which the milk from the same cows was sent. In this respect matters were brought to a head at the last show at Tatura, in Victoria, when some really astonishing results were obtained. All the usual precautions were taken to provide a fair test, and Mr. H. W. Potts, the Victorian Dairy Expert, was appointed to do the testing. The milking was done at 12 noon, and the milk tested with the following results:—

Owner.	Milk.	Test.	Butter.	Milk to each lb. Butter.
	lb.		lb.	lb.
T. O'Reilly, No. 1	39	5·6	2·49	15·64
T. O'Reilly, No. 2	35	5·5	2·19	16·00
T. O'Reilly, No. 3	38	4·6	1·96	19·33
Andrew Collie	32	4·1	1·46	21·94
A. Crawford	29	3·9	1·25	23·12
J. Ellis	26	4·1	1·18	21·94

As the butter returns of the winning cows were so high, Mr. Potts determined to test them again. The cows were accordingly milked at 5·30 that evening, and the results of the testing were as follows:—

Name of Cow.	Milk.	Test.	Butter.	Total Yield for 24 hours.	Equivalent to in One Week in Butter.
	lb.				lb.
Bauley	11	10·2	1·27	3 76	25·32
Pansy	11½	12·2	1·61	3·80	26·60
Dolly	12½	5·8	·84	2·8	19·60

Seeing that only some five hours had elapsed since the previous milking, the quantity of milk yielded was naturally small, but the increase in the percentage of butter fat was extraordinary. These cows were kept in the showyard for the night, and again milked and tested the following morning, when the fall in quality was even more remarkable than the rise at the previous milking, the results of the testing being as follow:—

	Lb. Milk.	Test.
Bauley	29	3·3
Pansy	24	3·8
Dolly	34	3·8

These results must raise grave doubts in the mind of every thinking person as to the reliability of showyard tests, and seem to point to the fact that in competitions of the kind some means must be devised for carrying out the milking in a manner more closely resembling ordinary milking conditions. But now Mr. O'Reilly, the owner of the cows, comes in. He at once concludes

that if these three cows give so rich a milk, though in his own opinion their milk is not much richer than that of many other cows in his herd, he should be getting a better test at the factory. He looks up his test and finds it to be 3·6 for the previous week. He naturally feels dissatisfied, and gets Mr. Potts to test all his cows. This is done with the result that there is a discrepancy as between Mr. Potts and the factory. The whole of these results are most unsatisfactory from every one's point of view, and we have been waiting for some time to learn the result of the further investigations which Mr. Potts undertook to make to solve or explain the great discrepancies involved. So far we have been able to gather nothing on the matter. We trust that the delay is only due to the exhaustive nature of the investigations, and that before long important results may be placed before the public.

If matters are allowed to stand as at present there is great danger of the present system of testing and payment for milk by results falling into disrepute.—*Australasian Pastoralists' Review.*

THE MILK TRADE.

PAYMENT FOR MILK ACCORDING TO QUALITY.

This subject is of ever-increasing interest, and, indeed, where farmers supply their milk to factories, be they co-operative or otherwise, it is essential to all concerned that such a system be adopted.

In the first instance, it has the advantage of fairness, inasmuch as those who go to the trouble of greater care and attention in the feeding and management of the herd are paid for their trouble on account of the better-quality milk sent by them to the factory, which, as we have said, pay for quality, not quantity, so that the injudicious feeding of roots and watery foods to produce a large quantity of milk is of little avail, but rather to the detriment of the producer.

Secondly, for the factory to be worked on a sound basis it is essential for the manager to be shrewd and observing to make the necessary profit for its working, and to do this money must not be thrown away in paying all the suppliers an equal sum per gallon for their milk, which in some instances might be from Jersey cows (notably rich) and in others from Ayrshires, which latter milk, although so valuable to the cheese-maker, takes a large number of pounds to produce 1 lb. of butter as compared with Jerseys.

All factories, therefore, co-operative or other, require some definite system of paying for the milk supplied. Sooner or later, no doubt, all will come to this system of payment for quality, and the sooner it be the better, as nowadays the margin for profit is pretty narrow, and is not to be squandered with nonsensical ideas that anpthing new is not good, and that what has done before will do now; we must keep up-to-date, however hard it may at first appear. A goodly number of factories existent at the present time have adopted this system with the greatest success, and no doubt wonder how on earth they could have got on as they did under the old system of management.

THE DIFFERENT SYSTEMS.

Our readers may be interested to know the older systems, which were, and are in a few cases used at the present, in valuing milk for butter-making. An American plan was to pour the milk received into a plan of regulation pattern and pay according to the inches of cream risen in a given time. Now, as will easily be seen, this system is, at its best, most unsatisfactory, due to the conditions which affect it; for instance, the volume of cream varies with the temperature and time taken in rising, and, again, the cream is no indication of the butter fat contained, as will be known to readers who have followed these notes and read remarks regarding the creamometer.

Another method was that each supplier's cream was churned separately, and was paid for according to the weight of butter produced.

This, however, necessitated an extra organisation of the dairy, caused great confusion, a great deal of bookkeeping, and resulted in the end in the factory turning out a very variable product.

Again, cream itself was bought, but for above reasons—namely, that an apparently poor, thin cream may be very rich in fat and *vice versâ*—it also is not to be depended upon.

But to proceed. This up-to-date system has been made possible by the new rapid fat-testing machines which have of late years proved such a boon. It must, however, be considered from two points of view; firstly, as to the value of the milk when butter is made; and then as to its cheese-making value.

BUTTER-MAKING.

We devoted an article a short time back to composite milk testing, so that very little need be said on that point; suffice to just briefly enumerate that each man's milk, as delivered to the factory twice daily, is weighed, and a proportionate sample to the quantity supplied taken and put into a large stoppered bottle with some preservative. This is done daily until the end of the week, when the bottle is well shaken and the fat determined by a Gerber apparatus.

This gives us the all-important factor—namely, the average percentage of fat in the milk for the week. It is now easy to value the milk from the butter-maker's point of view, paying only for the fat, the skim milk being returned to the farmer each day as the milk is separated. Now, all the fat, unfortunately, cannot be recovered from the milk, as in the process of separation, and again in churning, a loss, although a small one, does occur. This loss has, therefore, to be taken into account and deducted from the total percentage of fat in the milk.

It has been found by practical experience that if the work of separating and churning be carried out properly, ·2 per cent. is the loss of fat experienced in both these operations. Let us, therefore, calculate out the value of 100 lb. of milk to show how it worked out. Suppose the milk contains 4 per cent. of fat, the first thing to be done is to subtract the loss, which is 2 per cent., for separating and churning.

100 lb. milk contain 4 lb. of fat.

4·0–·2 equals 3·8, but as butter is not pure fat but has in its composition water, casein, salt, &c., an addition can be made to the fat.

3·8 lb. of fat will give, allowing for $12\frac{1}{2}$ per cent. water, &c.:

$$\frac{100 \times 3{\cdot}8}{87{\cdot}5} = 4{\cdot}3,$$ or slightly over $4\frac{1}{4}$ lb. of butter.

Now, suppose the factory is able to pay the same price per lb. of pure fat in the milk as is got for the butter, the water and other material contained in the butter giving extra weight sufficient to pay for working expenses in the form of labour, salt, paper, packing, rent, depreciation, &c., our 100 lb. of milk would come out as follows:—

	s.	*d.*
$4\frac{1}{4}$ lb. of fat at 1s.	4	3
90 lb. skim milk and butter milk, valued at 1d. for 10 lb. (a gallon)... ...	0	9
Total	5	0

for 100 lb. milk, or 6d. a gallon.

In many cases the skim milk is returned to the farmer, so in that case the fat only is valued and paid for, which in the above instance would amount to $5\frac{1}{10}$d. per gallon.

If the factory be a co-operative one, it is desired to pay as much per lb. for the fat in the milk as is possible, and at the same time pay expenses. If

1s. 2d. per lb. is realised for the butter when the fat is paid at 1s., all the better for the factory, but it is a narrow margin for expenses to pay the same for fat, as butter realises, taking carriage and all into consideration.

It would be here well just to indicate how the accounts are made up.

Say three farmers each send 5,000 lb. of milk to the factory in a month. After deducting all expenses they have a net value of 1s. per lb. for all fat received.

A's 5,000 lb. of milk contained an average of 4·2 per cent. butter fat—·2 per cent. (loss in separating, &c.) = 4 per cent. available.

B's 5,000 lb. of milk contained an average of 3·9 per cent. butter fat—·2 per cent. (loss in separating, &c.) = 3·7 per cent. available.

C's 5,000 lb. of milk contained an average of 3·5 per cent. butter fat—·2 per cent. (loss in separating, &c.) = 3·3 per cent. available.

Name of Supplier.	Lb. of Milk Delivered.	Available Average Per Cent. Fat.	Calculated as lb. of Fat.	Price at 1s. lb.	Price per Gallon (roughly).
A	5,000	4	200	£10 0 0	4·8d.
B	5,000	3·7	185	9 5 0	4·4d.
C	5,000	3·3	165	8 5 0	8·9d.

A SIGNIFICANT POINT

is here brought to one's notice—namely, that the first supplier, A, realises nearly 1d. more per gallon for his milk than does C, although each supply the same quantity. As can be plainly seen, it is the richness that tells, and the man producing the rich milk gets the best price. That the milk with the smaller percentage of fat in it is of less value to the butter-maker is due to the fact that the same percentage of fat has to be deducted for losses incurred in both cases, so that with rich milk, besides getting more butter, only the same loss is incurred. Take, for example, 100 lb. of milk containing 3 per cent. of fat—this—·2 per cent. = 2·8.

$$\frac{100 \times 2{\cdot}8}{8{\cdot}75} = 3{\cdot}2 \text{ lb. of butter yielded (or 3 lb. } 3\tfrac{1}{5} \text{ oz).}$$

	s.	d.
Say $3\frac{1}{4}$ lb. of butter at 1s. ...	3	3
90 lb. skim milk and butter milk at 1d. for 10 lb. ...	0	9
	4	0 or not quite 5d. a gallon.

Comparing this with 100 lb. of milk containing 4 per cent., it is worth exactly 1s. less. In keeping cows, therefore, for supplying butter factories, it is of very little use running away with the idea that the more you can supply the better, because this is distinctly not the case, as however you water it (through the cow) it is of no avail.

For the benefit of readers who would care to study these figures, it might be well to show how the ·2 per cent. loss of fat is arrived at.

LOSS OF FAT.

100 lb. of milk put through the separator yields 10 lb. (termed taking off 10 per. cent. cream), which will produce, say, 4 lb. of butter and 6 lb. of butter milk, leaving 90 lb. of separated milk.

Then if 100 lb. separated milk contains ·2 per cent fat loss to the butter-maker,

∴ 90 lb. „ „ „ $\dfrac{{\cdot}2 + 90}{100} = {\cdot}18$ lost.

If 100 lb. butter milk contains ·4 per cent. fat,

∴ 6 lb. „ „ $\dfrac{6 \times {\cdot}4}{100} = {\cdot}02$ loss.

${\cdot}18 + {\cdot}02 = {\cdot}2$ per cent. fat loss in both separating and churning.—*Farmer and Stockbreeder.*

WHAT PIG POINTS MEAN.

NEAT in the head (says *Rural Australian*) means a nose neither too long nor too short, a nice shapely keen-looking face, with bright, mild eyes, broad forehead, a good-tempered appearance. Ears, soft and pliable; when they fall a little to the front without actually being lopped, the point is good. Light neck and shoulders; for the coarser parts of a side of bacon, and those which fetch the lowest price, are the neck and shoulders, and the lighter those parts the better the side, and the higher price it will make. Deep in the ribs. Looking at this from a bacon-curer's point of view, a pig that is deep and round in the ribs will of necessity produce a larger proportion of first-class bacon. Thick in the loin. A pig with heavy loin has capacity for food, together with good digestion, and strong constitution generally. The loin is high-priced, and the weight of that should be kept up. Stout in the thighs. The hams are most important, and, in the case of pigs killed for the ham and middle (flitch) trade, the most valuable of all. Long silky hair indicates strength of constitution as well as lean meat. Such are conditions which indicate a happy union between thriftiness and lean meat—a union which suits both the curer and the producer.

The Horse.

STABLE NOTES.—No. 1.

BY W. C. QUINNELL, M.R.C.V.S.

WE propose to publish a series of articles, commencing in the present number of the *Journal*, on the horse, his diseases, general treatment, &c., from the pen of Mr. W. C. Quinnell, M.R.C.V.S.

The treatment which the most valuable and docile of all the friends and allies of man often receives at the hands of brutal or ignorant men is such that it behoves all who have the necessary influence and knowledge to exert themselves to ameliorate the horse's lot by all means in their power, and especially by leading horse-owners, to a general knowledge of the simpler ailments of the animal, and by instructing them in simple language, devoid of technicalities, how to detect and treat those ailments when the services of a veterinary surgeon are not available.

To the uninitiated, the horse is a mystery as to many of his diseases, and the symptoms often convey no idea (except to the man of veterinary science) of the seat of them. Even when the disease is diagnosed, the treatment is not easy to the unskilled person. Take a simple case. A horse has a toothache. He cannot masticate his food. In many cases the owner decides that the poor animal has lampas, and he proceeds to add to its torture by a process of burning and bleeding.

The following papers will have amply justified their publication if only a few horse-owners will take the trouble to study them and apply the knowledge thus obtained to alleviating the miseries of this noble animal.

Visible Mucus Membranes, viz.:—The lining membranes of the eye, the nostrils, and the mouth, also afford great assistance in indicating the presence of disease. The natural colour of the lining membranes of the eye and nostrils is a palish red or carnation, therefore any marked deviation from this would denote some disorder. As for example:—

Yellowness of these membranes indicates disease of the liver.

Lividity.—A non-oxygenated condition of the blood, as in diseases of the respiratory tract.

Slate-Coloured Appearance.—A condition of blood due to the poison of glanders.

Pink.—As in influenza or pink-eye.

Deep-Red Spots denote a depraved condition of the blood.

Pallidity.—Anæmia and general debility.

THE MOUTH.

The examination of an animal's mouth may be occasionally of great importance. Dry mouth and coated tongue inform us of digestive disturbance.

Redness indicates an irritable and congested condition of the alimentary canal.

A moist state of the mouth, from excessive secretion of saliva and accompanied by the animal letting the half-masticated food drop from his mouth (vulgarly known as "quidding") are diagnostic signs of disease of the teeth, or the presence of a foreign body, such as a thorn or a pin.

DISEASES OF THE HORSE.

DEFINITION OF DISEASE.

Before proceeding further with our subject, it is as well to give a definition of disease, and the best definition that can be given is "that it is the deviation from the state of health, consisting generally in a change in the properties or structures of any tissue or organ inadequate to the performance of its healthy actions and functions."

CONTAGIOUS AND NON-CONTAGIOUS.

Diseases may be broadly divided into:—

Contagious, viz.:—Diseases which arise from the introduction into the animal system of germs by the agency of persons, animals, or substances, such as anthrax, glanders, and influenza.

Non-Contagious, viz.:—Disease of spontaneous growth, such as constitutional disturbance in the lungs, liver, stomach, and other organs.

CAUSE OF DISEASE.

These diseases are generally due to the neglect of good sanitary precautions and bad stable management—for instance, improper ventilation, inferior food, over-feeding, want of exercise, neglect and privation, all tend to lower the animal system and produce ill-health.

GENERAL SYMPTOMS OF ILL-HEALTH IN THE HORSE.

The Pulse of the horse, as in other animals, is an important guide in determining the healthy state or otherwise of the patient. When in a state of good health the pulse is firm and regular. The number of pulsations per minute in an adult healthy horse are 34 to 36.

To Take the Pulse.—The most convenient place to take the horse's pulse is from the sub-mascillary artery, at the angle of the jaw. The fore and middle fingers should be placed on the artery in a transverse direction. There being a pulse in the thumb, this finger should never be used in taking an animal's pulse.

Respiration consists in the alternative enlargement and diminution of the cavity of the chest, whereby air is alternately inspired and expired. Inspiration and expiration thus alternate, in healthy adult horses at perfect rest, number from 12 to 16 times per minute. The movements of the flanks generally afford the first indication of quickened breathing. The movements of the nostrils must also be noted.

Temperature.—The normal temperature of the horse is 99 degrees Fahrenheit. To register this, a small clinical thermometer is inserted for a couple of minutes in the rectum, when it may be withdrawn and the index hand will indicate the exact temperature of the patient. Before inserting the thermometer it is as well to get the attendant to lift one of the animals fore limbs, which will prevent his kicking.

PULSE, RESPIRATION, TEMPERATURE.

Bearing in mind the given standard of the above in health, and by adapting the methods we suggested for ascertaining the same, there should be no difficulty to discover whether the animal is in health or not.

Increased pulsations, accelerated respirations or elevated temperature do not always indicate ill-health; for instance, exertion or excitement will cause the above irregularities, but there is this great difference in disease, the irregularities are persistent and are always accompanied by other morbid signs, whereas in a healthy subject they are only temporary.

Poultry.

THE INCUBATOR.

EVIL EFFECTS OF BAD EGGS.

WITH regard to bad eggs in incubators, there are two points which arise: First, as in the unfertiles, the comparative coolness of the egg; and, secondly, the evil which the decaying germ does to the air in the incubator. Ventilation in incubators is all important, and should there be the least smell from bad eggs the whole hatch suffers, and often suffers until it becomes a complete failure.

If eggs are tested on the seventh and fourteenth and nineteenth days, there is no fear of the terrible catastrophe of a bursting egg in the machine.

When this happens, all the eggs should be removed at once from the incubator, the drawer or tray thoroughly cleaned, the eggs carefully wiped with a hot, damp cloth, if there is the least taint of the exploded egg upon them, and the machine must not be closed again until every smell of the egg has gone, or a good hatch may be given up altogether.

Sometimes explosions occur owing to an egg being cracked. Then decomposition goes on, and the result is truly awful.

All this may be avoided by the careful testing of the eggs at these stated intervals.

HENCE EGGS OF EQUAL SIZE.

Another point about eggs in incubators is that they should be about the same size, if possible, as the heat varies in most incubators, according to the comparative distance from the source of heat, which is generally a tank or hot plate suspended above the eggs. Large eggs would be hotter than the small eggs.

If different-sized eggs must be used, then the smaller eggs should be slightly raised, so as to get the same amount of heat.

Then, again, the filling up of incubators with eggs at an earlier stage of incubation is also bad. I never can quite see why people do it, as one does not save much time and runs a great risk.

Say there is a 50-egg machine, and 10 unfertiles are taken out at the end of a week. What is the use of filling up the machine with another 10 eggs? At the end of three weeks the 40 eggs are due, but there are 10 eggs to go a week. You therefore either leave the machine a week to clear these out, or you put 40 more into the machine, and the complications increase, whereas it is far the best to let the 40 have a good chance and then fill up with 50 at the end of three weeks.

It is much more difficult to regulate the temperature in an incubator when there are eggs of different periods of incubation in the same drawer.

EGGS FOR PROFIT.

POULTRY culture divides itself naturally under two heads—the rearing of fowls for table purposes, and the rearing and subsequent management of fowls kept solely for egg production. Some poultry-keepers combine the two to a greater or lesser extent, but in the present article I should like to consider the hens kept for eggs alone—eggs not sold for sittings, but marketed for consumption. There is, indeed, another branch—the rearing of poultry for exhibition purposes, and the sale of eggs for hatching from prize stock; but this the farmer, in spite of the profits that some people make out of it, should leave severely alone.

We should start with pullets, and it is not advisable to have these too early hatched. Then we must consider whether it will be profitable to sell them or keep them longer than twelve months. If we are well satisfied with their laying, perhaps it is best to keep them another year; but circumstances must decide.

The next question is, How many should we keep together? I am dealing with birds in fairly large quantities—say, 100 or 200—and it is inadvisable to let more than 50 run together. Even then the yearly average will not be so high as from smaller pens. These 50, if in confinement, should have from a quarter to half an acre of land. It may suit the owner, however, to give them entire liberty. This is really the best plan; they are less prone to disease; they can forage for themselves, and, by picking up a portion of their food, lessen the corn bill. But, on the other hand, in this case there is the fear of not getting all the eggs. Hens are prone to steal a nest, as it is termed—laying in a hedge or behind a clump of bushes—and such nests are often hard to find. It is sometimes possible to effect a combination of restraint and liberty. Hens do little, if any, damage to arable land, except when the corn is quite young, and again when it is ripe, and if they are confined at such times they can be let loose when the corn is too tall to be damaged, and again when it has been carted.

TWO HUNDRED HENS TO THE ACRE.

But if we keep 200 hens to an acre, we must remember that the land will not bear them so thick for long, and even cutting the grass and giving a dressing of lime is only a temporary measure. A time must come when the land becomes tainted, and before that period the birds must be removed to fresh pasture.

Land sheltered on one side by a belt of trees is a great advantage, especially if they lie on the north or east, for, though poultry will thrive fairly well in exposed positions, they have first to become acclimatised.

The question of feeding our stock is of considerable importance. Laying hens require liberal feeding. A hen in full lay will sometimes produce $\frac{3}{4}$-lb. of eggs in a week, and this tax on her requires making up. Yet the difference in the amount eaten by a non-laying and a laying hen is really not great, and therefore we want as few unproductive fowls as possible. All must share alike, and have as much as they show keen appetite for. To stint is very poor economy. To make sure they have enough, the owner should occasionally handle the birds on the perch at night. The crop should feel full. Wheat especially swells inside the crop, and overfeeding on wheat should be avoided. Maize may be given if we are not setting the eggs and the birds are not pure Asiatics. For birds with entire liberty and of an active disposition, such as Leghorns or Minorcas, it is quite harmless. The danger in maize-feeding is in its use for well-fed breeding stock kept in confined runs.

THE MORNING RATION

should be meal, and this goes further if mixed with boiling water, which partially cooks it, and renders it more palatable. In cold weather it should be mixed with broth made from boiling bones or butcher's rough meat.

The birds, once established in their houses, are very little trouble. Two visits to feed, two to collect eggs, is all the daily attention they need. A weekly cleansing of the house must not be forgotten, and a coat of whitewash

each six months. It is in this respect that laying fowls can be recommended in preference to table poultry, which want so much more attention. Of course, fresh chickens must be raised to take the place of the fowls that have to be cleared in the autumn, and it is here that the owner should strive to improve his stock. He must always have his eyes open to note which breeds or crosses are doing best, and be ready to eliminate the less productive kinds.

Provided no disease appears, and if ordinary vigilance is practised there is no reason why it should, a certain profit is bound to accrue to the owner. The old birds should fetch the price of rearing the pullets. I mean the sum received for their sale should equal the out-of-pocket expense in rearing the pullets before they begin to be productive, and the profit should be between the cost of food (for other expenses, once the houses are built, are nominal) and the price received for eggs. To say what the profit *ought* to be is absurd, for there is no "ought" in the matter; it is bounded by many circumstances impossible to foresee. In feeding large quantities the cost per hen is reduced, and should not exceed 5s. per annum. It may not be so much, but liberal feeding is absolutely necessary if we want plenty of eggs, and especially in winter, when the price is high. Many poultry-keepers fail in this respect.—*Farmer and Stockbreeder.*

HOW TO TREAT A SITTING HEN.

MANY who have the good fortune to live away from towns and cities and their 10-perch back yards, will say: "Let her alone, and she'll come home, bringing her chickens behind her." There is no doubt that a great deal of the advice given by experienced poultry breeders to their fellow-colonists, does not in the slightest degree apply to the farmer with his many acres of wheat, maize, panicum, and lucerne, which afford such splendid runs for poultry, with his barns and outhouses whither the good "clucking" hen loves to resort to hatch out her brood in peace. Here the advice to "let her be" is no doubt the best that can be given. There is probably not a single farmer who cannot recall a score of instances in which a missing hen has suddenly walked into the kitchen some fine morning with a dozen sturdy, cheeping chicks running round her. Where that hen laid, how she protected her eggs during days and nights of rain and storm, she alone could tell, but the simple fact remains that she is there—plump and healthy looking, no vermin about her, and her chicks are all fat, happy-looking balls of fluff. The writer, at one time, used to keep nearly a hundred fowls on a scrub farm. Some of these were annually shown in the poultry sections at exhibitions, and one or two invariably took prizes. Now, how were these fowls managed? They laid vigorously, and the contract held for the supply of a certain number of eggs weekly all the year round was easily carried out.

First of all, a nice fowlhouse was built, provided with roosts in proper positions, laying boxes, and a detached compartment for the sitting hens. The floor was regularly cleaned up and dusted with lime, the hens could always get a good dust bath, and generally everything was done to ensure immunity from disease and vermin. But all precautions were useless; disease came. Morning after morning dead fowls were found under the roosts, the sitting hens were alive with vermin, and the idea that poultry would pay was being gradually dispelled, when it was determined to do away with the fowlhouses, and let the birds live in the open air. The reason which led to this decision was that on one or two occasions a lost hen returned as described above, one of these hens actually bringing home sixteen healthy chickens. Her nest was found when the cornstalks were being cut down, under a half-burnt log in the open field. So a couple of roosts were put up under a bushy tree, a wire net fence was run round about half-an-acre to keep out snakes and dingoes, and the fowls were turned into it. Some roosted in the tree, others preferred the regular roosts. Boxes were discarded. Shelters of waste shingles were provided for the laying hens, and in each corner a rough bush shade afforded protection from the sun during the day.

The fowls were only kept in the yard at night. All day they roamed about wherever they pleased, but in winter and summer they roosted in the open air regardless of weather. They laid, as a rule, in the yard, not being allowed out till that duty was performed. As for the sitting hens, they were never looked after; food and water were always there when they chose to come off the nest, and they invariably hatched a good proportion of chickens. In short, the poultry yard soon became a regular source of weekly income. Eggs at that time were sold at 2s. 6d. per dozen, or on contract at 2s. all the year round. Table fowls were worth from 3s. 6d. to 4s. per pair, but even at the prices obtainable to-day, these fowls would have paid well. Very little feed was required for them during the latter part of the winter and early spring, for they picked up all they wanted during the months succeeding the first ripening of the corn and panicum. Buckwheat was sown in patches here and there, and they carefully harvested the grain. Then there was the lucerne field and the potato ground, which provided them with the necessary animal food in the shape of caterpillars, grasshoppers, snails, and insects. I have not mentioned the turkeys, of which there were several. These not only kept down injurious caterpillars on the crops, but they used to wander about the standing scrub, where they found abundance of land shells (otherwise snails). They absolutely cost nothing to keep, and the gobblers fetched £1 each at Christmas time. The moral to be drawn from this, for the farmer or landholder in the country or suburbs, is—Do away with the *foul* fowlhouses; let the birds alone; feed them when food is scarce outside; give them plenty of crushed bones and oyster shells; and as for the sitting hens, "Let them be."

Treated in this manner, each fowl should lay at least 150 eggs a year—many would lay 180 eggs.

Take the lesser number, and with eggs at an average of 9d. per dozen, each hen is worth, for eggs alone, 10s 6d. per annum. Eggs often bring 1s. 6d. per dozen in the Brisbane market, and the farmer frequently has to sell at from 4d. to 6d. per dozen, so that an average of 9d. all the year round is not out of the way. Of course, it is necessary to keep a good laying strain to obtain good results. Minorcas and Brown Leghorns are good stock to keep for eggs, whilst for large table fowl, the Plymouth Rock is as good as any. Fancy breeds are all very well for show purposes, but they may be left to townspeople with a fad, and with plenty of money to expend on valuable show-birds. It would be a good thing for breeders of useful fowls if substantial prizes were awarded at some of our shows for a "laying competition." The duration of the competition might extend to a week, fortnight, or month. The competing fowls should be placed under the care of a thoroughly practical, utterly disinterested caretaker, and the competition should not commence until the birds become somewhat familiar with their new surroundings. Careful notes should be taken of the feed, as to kind, quantity, &c., and generally the whole behaviour of the fowls should be noted day by day. Each owner's eggs should be marked with the date and hour of laying and be kept in a separate locked box. At the conclusion of the trial, the prizes should be awarded according to the conditions primarily laid down, and the decision of the judge (one good judge is preferable to half-a-dozen) should be final. In framing regulations for such a competition, which would be far more interesting and valuable than one in which the colour or position of a feather or hackle, or the exact number of serrations in a comb, are the objects aimed at. It does not necessarily follow that the first prize be given only to the bird laying the greatest *number* of eggs. A first prize should be awarded to the bird laying the greatest *weight* of eggs in a given time. A hen which lays five large eggs in a week is more profitable than one which lays six small ones. Perhaps, however, it is wrong to say *is* more profitable, because eggs are bought by the dozen instead of by the pound. Why this should be so I cannot understand. It has often been pointed out that a produce merchant will not give the same price for small potatoes, English or sweet, that he would give for a fine medium-sized tuber. The miller will not buy small pinched grain at any price. The fishmonger will not

look at small fish. So it is with the fruit dealer; in fact, in almost any trade in animal and vegetable products size is a consideration. Why should a different practice obtain with eggs? Go to any grocer for a dozen of eggs. He gives you indiscriminately large and small ones. You grumble at the small ones. "All the same to me," he says, "take big ones. Eggs are eggs." But where does the sense of this come in? Surely a dozen pullets' eggs are not equal in food value to a dozen black Spanish hens' eggs?

I have known even large duck eggs, double-yolked hen eggs, and pullets' eggs to be included in a dozen shop eggs—all sound and fresh—but surely an absurd mixture. If the housekeepers would rise in a body and demand that eggs should be sold by weight, everyone would benefit, and certainly the good laying breeds of fowls would take the place of many of the miserable "Egyptian" looking scarecrows which disgrace many a homestead, and would be dear at 6d. each.

I have been led away from the subject of the sitting hen and her management by an insensible train of thought; but will conclude these remarks by a quotation from "Lloyd's" on the subject, which may be read with profit by those who are rearing poultry in the city and in fowlhouses:—"The sitting hen requires no very elaborate treatment; but a few suggestions may be acceptable to the beginner. It is always better to remove the broody hen from the nest in which she has been laying, which is also frequented by other hens. She should be placed, if possible, in a shed or outhouse away from the laying stock; or, if this cannot be done, a piece of wire-netting must be arranged in front of the box in which she is to sit, so that the other hens cannot interfere with her. To ensure a sufficient supply of moisture the nest should be on the earth. Nest-boxes without bottoms are preferable, or in lieu of these several inches of moist soil should be put into the box. About 15 inches square is a good average size for a nest. A small quantity of hay should be used to make it with, and the earth should be slightly hollowed out, so that the eggs will incline towards the centre. When a hen becomes broody she will remain in the nest both night and day. When touched she will scream and cluck as if calling chickens.

In removing her to the nest in which she is to sit, it is recommended that she be gently lifted off the nest in which she has been laying, and then replaced quietly; this being done two or three times before she is removed to the fresh nest. This will help to tame her, and cause her to take less notice of the move. After she is removed to the fresh nest, she should have a good feed of grain, and then be left for thirty-six hours. By that time she will be well settled. When the eggs are given her for incubation, if she is tame enough to allow herself to be touched and stroked with the hand, the eggs can be placed under her, two or three at a time, and she will tuck them away with great delight, pushing them gently with her beak. But should she be wild, it is better to put the eggs in the nest, the hen being first lifted off, and then to stand her at the edge of the nest, when she will walk on. The eggs selected should not be greasy or dirty, neither should any abnormally large or small ones be selected. There are many people in the country who assert that they can pick out eggs that will hatch out cockerels or pullets, as desired, the shape of the egg, or the position of the air cell in the egg, being stated to be the guide.

It is difficult to understand how this theory can be relied on, for the interior of the egg, which contains the germ, is determined before it is enveloped by either the albumen or the shell. The germ has, therefore, no effect on the conformation of the egg. So with regard to the air-cell. This has for its function the supply of oxygen to the embryo chick, and this expands, as the chick grows, by the evaporation of the surplus moisture within the egg. The position of the cell would appear to be immaterial.

The hen need not be taken off the nest the first day of incubation, but if she does not come off the second day, when the front of the box is opened, she should be removed gently, great care being observed not to take up any of the

eggs with her Water and grain, such as barley or maize, must be placed ready for her, and after she has had a good feed she will usually go on again of her own accord. From 10 to 20 minutes is about the time she should be absent from the eggs. A dust bath must be provided; also plenty of grit. The chicks should be looked for on the twenty-first day.

[On this subject of poultry management, I would recommend the poultry keepers to read the excellent paper from the pen of Mrs. Lance-Rawson, which was read by Mr. Whiteley at the Agricultural Conference held at Rockhampton on 11th, 12th, and 13th May last year. It will be found in Vol. III. of this *Journal*, page 110. Ed., *Q.A.J.*]

THE POULTRY BUG OR TICK.

By MRS. LANCE RAWSON.

The other colonies are inclined to ridicule Victoria for making an effort to keep the poultry tick outside her boundaries, but I am convinced that it will not be very long before both Queensland and New South Wales will be under the necessity of using drastic measures to restrict or curtail the ravages of this same parasite. A few correspondents tell me that they have known and had experience of this tick for years. If that is the case, then, like most of our pests in this country, it has been lying semi-dormant, awaiting the conditions which only now matured for its successful development, for it is certainly most remarkable the way it has sprung to life and activity in at least *three* of the colonies at almost the same time. During my lifetime I have observed that several of our worst diseases and plagues, after being slightly known, or to only a few of the most observant farmers, for several years, have quite suddenly developed into full-grown plagues, with any amount of capacity for doing harm. The rust in wheat down South, gumming in sugar-cane up North, the disease in grape vines, potato disease, the fruit fly, orange moth, all have been noticed by a few for a long time before the natural conditions had actually matured properly to give them the exact impetus that converted them into the dangerous plagues they at once became. I do not suppose that any one of them could have been prevented, but certainly, by taking them at the very beginning, their ravages might have been minimised. It is bad policy at any time to disregard the small signs and symptoms of trouble among the crops. A new sort of fly (never noticed before), a peculiar caterpillar, an odd butterfly, should always be regarded as danger signals to the man who lives on and by the land. With this poultry tick, had it been looked into and means taken for its suppression when first noticed, many of our poultry keepers would not now be lamenting the loss of so many of their birds.

The first I ever heard of the tick, *as a tick*, was about two years ago, when a lady living in the Springsure district, Central Queensland, wrote me about her turkeys, that were, she said, dying from the effects of a sort of tick that lived in the cracks and holes of fowlhouses and roosts, and came out in hundreds at night to prey upon the defenceless birds. I could only suggest fumigating or scalding, for the pest was one I could not understand, and had no experience of to guide me; but to-day there is "no possible doubt whatever" that the poultry tick is going to be a pest *all* the colonies will have to reckon with very shortly, and unless the different Governments insist upon all poultry-keepers within their colonies taking prompt and drastic means for exterminating them before they get too great a hold, the poultry industry, which is only just beginning to take its place among other and older industries, will surely suffer. This parasite is called a tick, probably because so many varieties of tick *do* exist, and it is fashionable just now to call everything a tick, but I very much doubt if it is a tick. Its habits are more like those of a bug or louse; the tick invariably attaches itself to the animal it preys on, and remains thus attached till it reaches maturity, and falls off either to lay its

eggs or to die. Not so the so-called poultry tick, which lives in the cracks and holes, and, even under the bark of trees where fowls roost, bug-like, and only ventures out at night to feed, and returns at daylight to its ambush. I am told that any light or noise will drive them to their holes, and the most careful search will fail to discover them. About every ten or twelve years a new plague appears, conditions, apparently, mature quite suddenly, and so we awake to find we have a new enemy to battle against. Nature is inscrutable in her workings; for years she is slowly sowing the soil, each season only advancing but a little way, till some great change comes, such as a long drought or a big flood to rush her work to its climax and mature the harvest she has been years preparing for. It is very hard to believe that all things are working together for our good, as we are told they are. One naturally wonders to what end were the ticks sent, save to ruin the squatter, the milkman, and now the poultry keeper.

I see by a late paper that two or three writers are advising a dip for fowls infested with ticks. Whoever they are, they know very little about fowls to advise anything of the kind. Interfere with the feathers and you seriously effect the health of the bird. As well kill them outright as dip fowls in any compound that soils or clogs the feathers. A Victorian poultry keeper, writing to the *Australasian*, gives the following as his experiences with the tick, proving pretty conclusively that the pest must have been known down there for some time. He says:—"I have heard and read much concerning trees as roosts for fowls, and that ticks will not live in green trees. My experience is that they will live and increase to a great extent on green, growing trees, as well as any other place. At the present time there are trees that serve as roosts for our fowls, and they are covered with ticks under every piece of bark that is the least bit loose, and some of these pests are almost ½-inch in length. We never find large ones on the birds, but sometimes the patches of eggs and young ticks are on nearly the whole surface of the fowl's body. Our unfailing remedy for these is kerosine, and for chickens a little salad or other thin oil mixed with kerosine, as the kerosine alone will scald and bring off the skin. The ticks will, I am told, creep into horses and deposit their eggs. I have known them almost cover some young puppies in less than three hours (with eggs) in the daytime too." If the above be a sure statement of affairs in Victoria, they are indeed shutting the stable door after the horse has been stolen. But again, I am inclined to think that the writer whose words I quote has mistaken the common grass tick for the so-called poultry tick when he alludes to it as being found on trees and under the bark. Also the poultry bug (or tick) would not lay its eggs on horses or puppies, the usual places being amongst the droppings and dust in the poultry house and in the cracks and crevices of the walls and roosts. I have seen a Leghorn rooster's comb one mass of grass ticks, in a very dry season, when the latter were plentiful, and I have seen an opossum's ears covered with them so that you could not put a pin between, and though frightfully weak from the combined effects of drought and loss of blood, the little animal was apparently quite immune to tick poison, as was also the Leghorn rooster; but in both instances, the ticks were the grass, or as they are usually called, the *scrub ticks*, which lay their eggs under the loose bark in deadwood, and everywhere in the scrub in fact.—*Australian Tropiculturist.*

THE FANCIER

Is often laughed at, and more often inveighed against, as being a faddist pure and simple, and of no earthly use from a practical point of view to the poultry man. In fact, it is very generally averred that he is the man above all others who is fast ruining, if he has not already done so, the good properties of our different breeds of fowls, both for their laying and table qualities.

While granting that in many instances the strictures are in some sort deserved, I must still raise my voice, as one who has some knowledge of the

matter, against this very erroneous idea. For there is no doubt about it that the true fancier—that is, the man who has devoted his time, energy, and experience to the producing and making known the best breeds and strains and crosses for the table or laying purposes—is and has been a benefactor to the poultry man.

In-breeding is the bane of the poultry yard, and the sight presented to one who goes about at all among the farmers and various other places where fowls are reared anywhere in Tasmania cannot fail to be impressed with the extent to which this suicidal policy is carried on. It can only result in ultimate loss, for weak stock are sure to follow this method, fowls that are no use at all for table, and that will not lay sufficient eggs to pay for their own food; weeds in every respect, that's what they are.

Well, the true fancier is the man that helps one out of this difficulty by supplying good well-bred stock, either cocks or hens, and a change of blood is necessary every year at least. This is his mission, and if his aid were sought a little oftener than it is, I know what the result would be. I have kept mongrels and purebreds, and I know which have paid me.

It was only last week a friend, whom I had advised to purchase some good stock, but who declined because the price was a little high, so he then thought, acknowledged his error, and lamented his loss of time, energy, money, and patience in looking after and feeding a lot of mongrels he had "picked up cheap." Said he: "Mine have been eating their heads off ever since I bought them, with no beneficial result to me, while yours have been laying all the time. For the future I'll buy good stock." This is what it will pay everyone every time to do.

Mind, I don't say any one word in defence of those insane individuals whose sole mission is to breed so as to obtain a certain colour, or lobe, or leg, or the dozen and one fancy points so dear, to the detriment of shape, weight, and good laying qualities. These deserve to be driven from every showroom in which they exhibit, as tricksters and opponents of all that is desirable to be obtained by poultrymen. But the true fancier—that is, the man who breeds the best kinds only, and makes a study of his business for utility's sake, and with the object of making his and everybody else's business in the poultry line a profitable one—this is the man who should be supported, and whom I will lift my voice and use my pen in defending every time as the real friend of the farmer and cottar generally, and the only true fancier. He should be encouraged, for he deserves to be, and is the man from whom stock should be bought. There are good breeders now in the colony who work solely on the line of utility, and their success should be to the farmers' benefit as well as to their own.

We all know what sort of stock the farmer or dairyman gets by breeding from mongrel bulls and cows of the same strain year after year—weeds. When he wants to change his methods and his strain, and make his business as a dairyman pay, he goes to the man who has made a study of breeding his stock for their milking and butter-producing qualities, pays his price, and takes his choice, with the result that he benefits in the progeny raised subsequently, and does not usually forget the lesson he has thus learned. He does not for one instant think of calling the breeder of the special strain of cattle, from whom he has made his purchase, a faddist, for the benefit he has gained is in itself too patent and quite sufficient to show him that hitherto he had been working on unprofitable lines.

If this be true in regard to dairying, and we all know that it is, why should it not be true also in regard to poultry-raising? And I know that it is. If the one breeder is not a faddist, why should the other be called one? Pure stock, or stock specially bred for their separate qualities, are necessary to both industries, and the man who breeds them is just as much a benefactor of the one calling as the other. Therefore if any reader of these "Notes" should be unfortunate enough to possess a yardful of mongrels, the keeping of which is almost always a dead loss, take the advice of one who has gained experience

very dearly, and obtain some fresh stock from honest breeders—there are many such—and they will never regret it. The change effected will not only be surprising, but pleasing to such a degree that the old method will be discarded never to be again reverted to.—"Utility," in *Agricultural Gazette*, Tasmania.

HINTS ON DUCK FARMING.

DESCRIPTION AND SELECTION OF STOCK.

To obtain success in breeding ducks, as in fowls or any other bird or animal, those wishing to launch out in the venture must first understand a little of the habits of their stock. This is best obtained by a chat with those who have had experience in the special line required, for practical experience is gained only by much time and labour, and often costs a considerable amount of patience and cash. In my former article I gave some ideas concerning localities, mode of breeding. The intending duck-breeder must then cast round for stock to start upon. If he proposes to breed for the table he must procure breeds of large frame, and well laden with flesh; if for egg production, then, as in fowls, the smaller and more active varieties are best.

AYLESBURYS.

The Aylesbury duck is considered an excellent breed for the table use; in fact, is counted as the bird of the London market on account of its white flesh. The breed is of English origin, coming in the first place from the town of Aylesbury, in and around which enormous quantities are hatched and reared for the metropolis. This is done by cottagers and their families, and the industry is carried on in a most systematic manner. It is no uncommon sight to see a ton weight of ducklings, says Mr. J. K. Fowler, leaving the district of Aylesbury by train in a single evening, and this goes on for months. The birds are marketed at from 6 to 8 weeks old. The returns for this town and immediate neighbourhood, it is estimated reach the sum of £20,000 annually. This variety attains a great size at an early age, and the flavour of the flesh is reckoned to be better than other breeds. They have been known to attain the enormous weight of 32 lb. for three birds (one drake and two ducks), but it must be bore in mind that for breeding purposes, these exceptional weighty birds are of little or no use at all. A bird weighing about 7 lb. will produce a greater percentage of fertile eggs. In their native village the cottagers keep them in out rooms at night, but during the day they have free access to the river, and are driven to their various homes at night. To distinguish their property, the owners brand their ducks with marks of paint on the white feathers.

The colour of the birds is pure white, with a long head, and long pinkish white bill, and legs orange, but in warm climates the bill becomes tanned, and appears more orange than white. A good way of keeping the bill clean, is to place gravel or coarse sand in the drinking water, which acts as a rasp in keeping off all discoloration, but of course these are only minor matters unless they are being bred for exhibition purposes. The breed is rather scarce in South Australia, only two or three people taking an interest in them. Mr. Joseph Smith, of Parkside, having some exhibition birds, while Messrs. C. Rake and Sons, of Enfield, have produced some good breeding sized birds.

PEKINS.

The Pekin duck, as the name intimates, hails from the "land of the pig-tail," and has proved at any rate that one thing has been imported from China that is of value to our country. The Pekin seems to stand our warm climate better than most of the other breeds. They began to "take hold" in England about 17 or 18 years ago, but are not so plentiful as the former variety, although this cannot be said of them in Australia. Their advent into the poultry world was heralded with a flourish of trumpets as a good-laying strain, and comparing them with various other table varieties, they can hold their own,

but they may be more properly termed a table bird. Their flesh is perhaps not quite so fine and delicate as the Aylesbury, but they produce a good square frame, and are a meaty bird when dressed. They cross well with the Aylesbury, whose introduction into their midst tones down the colour of their flesh, and makes a good table bird—they mature more quickly and often attain greater size in the time. The plumage is soft and loose, being white, with a tinge of yellow in the under down, which gives them a light yellowish appearance, and is a sure sign of purity of breed, as they lose this to a great extent as the Aylesbury strain gets in. The head is short, and likewise the bill, which is bright yellow, the breast and back are wide, while the feet are bright orange. The Pekin is perhaps the most extensively bred strain in South Australia, where there are some good table flocks, also exhibition specimens to be seen. In the latter Mr. J. H. Hobbs, Mr. R. Nischke, and Dr. R. E. Harold have done good work, while the latter has taken the attention of Messrs. C. Rake and Sons, and Mr. John F. Mellor, both having some splendid stock birds kept for breeding next season's supply of table ducks.

ROUENS.

These have their origin in France, although some persons have expressed doubts on that point. They are not usually bred for the export trade on account of their dark plumage, which goes against them, inasmuch as when plucked the skin is darker, and the pin feathers being dark also, make the appearance not so attractive; yet their large size is a great quality in their favour, as they exceed both Aylesbury and Pekin in weight. A pair of prize-takers in England turned the scale at 22 lb. 2 oz., but, as before stated, this is only obtained by excessive fattening, and at a certain cost of losing fertility in the eggs. They are harder than the white varieties to breed to colour, owing to their very uniform and complicated markings. In colour they greatly resemble the wild Mallard duck of Europe, from which it is surmised they may have sprung, but that domestication has put weight on all round. The drake is truly a very handsome bird, with his metallic green head and chocolate breast, having a narrow white ring dividing the two colours on the lower part of the neck, but not quite meeting round it; the under part is delicate French grey, while the back is a greenish-black. The duck is of a brownish appearance, having the feathers pencilled round with a dark brown. Both sexes have a broad ribbon mark of bright metallic blue or green across the wing. The bill of the drake is dull yellow, with a green tinge, while the female has a darker colour. The breed is rather scarce in South Australia; in fact, they seem to have decreased in the colonies during these last few years, but through the enterprise of Mr. John F. Mellor, of "Holmforth," Fulham, some excellent birds have been imported from Europe, and he has been rewarded during the last season by taking all the prizes at our two leading Adelaide Shows, 10 pens taking 11 prizes. They cross well both with Aylesbury and Pekin, and are then a good marketable bird for colonial consumption.

MUSCOVEYS.

The Muscovey or "Musk Duck" seems a comparatively distinct species, and the progeny of a cross between them and the more common kinds has been found decidedly unfertile. In fact, I have found that they do not mate with other ducks if they have their own choice, keeping with their own kind in all respects. Their native country is South America, where they enjoy the warm climate, and breed well. They are in great numbers in the Amazon district. They are black and white as a rule, but the colour varies greatly, some may be seen pure white, while others are black, and some of a slate blue hue, a peculiarity about them is ths bare skin about the head, generally lumpy and red. They are splendid eating, bnt they must be killed while young, or else a musky flavour will pervade the body, which is not pleasant. They are beautifully plump, and when plucked, the breastbone, instead of being above the flesh on the breast, is almost lost sight of altogether in a valley. The drake is of great

size, and often attains the large weight of 10, 11, and 12 lb., while the duck is also well up with 6, 7, and 7½ lb. each. They grow quickly and mature very early, being fit to kill as early as 8 weeks old, but even then weighing well up to other breeds of ducklings that may be about 4 to 6 weeks older. They sit well, and bring off large broods of young, and are good mothers; nevertheless they are great scavengers, and require plenty of meat, which is best boiled. They will often eat each other's little ones to satisfy their appetites. The drakes are much given to fighting, and become very ragged and dilapidated towards the end of the season. The ducks are not great layers, but keep at it on and off nearly all the year if left to hatch their own young. Their eggs are large and of a creamy white colour, 2 dozen weighing 4 lb. 12 ozs., or five eggs going to the lb. Mr. Meller is also an extensive breeder of these, but thinks they cannot be improved upon for table use by crossing with other breeds, but better let them keep to themselves and breed as naturally as possible.

There are other breeds which are said to be good for table use, but they are not in vogue to any extent. So leaving the heavier varieties, I now turn to the laying strain, which has proved itself so remarkable of late, viz.:—

INDIAN RUNNER DUCK.

This is to the duck world just what the Leghorn is to the fowl breeds, an out-an-out layer, and has not been beaten yet; in fact, nothing can come anywhere near it when laying powers are in question. They are somewhat small in structure, weighing about 3½ to 4½ lb. each, and carry themselves exceptionally erect, so much so as to become quite comical. They are good foragers, travelling over a great distance in a short time in search of food. The drake has a head of bronzy green, while that of the duck is faint fawn, necks white, and the coloured parts of the body in both sexes are of a soft fawn shade, that of the drake being finely pencilled, with a reddish brown tinge on upper breast, while the duck has each feather centred and laced round with lighter buff. The legs of both are orange-red. The feathers lie close and compact. Their eggs are smaller than those of the general run of large ducks, but they make up for size in quantity. Two dozen eggs that I tried weighed 4 lb. 1 oz., or a little over six eggs to the lb.

Some idea of their laying power may be gained from a note given me by Mr. S. H. Pitman, of Payneham, who is a successful breeder of the kind. Nine ducks, hatched on 16th November, 1897, up to 24th February, 1899, laid 1,627 eggs, being an average of 181 eggs per duck for 9 months' laying, and twelve young ones, hatched in the middle of August, commenced laying in the middle of December had laid up to 31st January 104 eggs, and in the 24 days of February laid 225, being an average of 9½ per day, or a total of 319 in 2 months. Thus proving that even in the hot summer months they lay well if hatched at the proper time. Mr. John F. Mellor also supplies a memorandum of eggs laid by three purebred ducks, being 432 eggs in 12 months—equalling an average of 144 eggs each, but during this time indisposition caused a cessation, otherwise average would have been greater. Mr. Mellor's crossbred Indian Runner-Pekins are also laying well, having started to lay at 12 to 14 weeks old, their eggs being yet small owing to the youngness of the birds, weigh 3 lb. 11 oz. for 2 dozen or 6 eggs to the lb., but these will increase in weight as they grow older. The crossbred birds are heavier and are more chubby in shape; they can be distinguished at a glance, having a smoky appearance about the whole plumage, and bid fair to become larger than the purebred specimens. This will no doubt be an acquisition, as it will hit the happy medium of a good all-round class of duck, putting more flesh on the true bred Indian Runner, and on the other hand making the larger breeds crossed more productive in eggs, and it is believed also more fertile for breeding purposes, but this has yet to be proved by a little practical experience, for the crosses are new as yet.

In conclusion, it must be borne in mind that the largest ducks of any special breed are not always the most productive, that is, those that have been

fed up to an exceptionally heavy weight, and therefore should be avoided by the "breeder." They are what are called "exhibition birds," and are used merely as show specimens. But on the other hand, be sure and not choose the small and stunted ones, or the results will be equally as bad. When selecting stock birds see that they are of a fair weight, good, strong, square-framed specimens, and above all see that no inbreeding has been connected with them, or birds that are apparently strong and healthy will thereby throw sickly stock, which will be more liable to disease, and the results will be far from satisfactory. If a few of these seemingly minor details are observed in the first place, much time will be gained, and as time in all instances means money, it will be seen that these little precautions will make financial statements much more encouraging.—*Adelaide Observer.*

The Orchard.

BUDDING MANGOES.

Mr. R. Bunnage, of Gracemere, has successfully budded two mango-trees, and one of these has borne fruit for the past two seasons. The other, although the buds have united properly, has not yet begun to bear. The tree to be budded should be in full growth, and all the young wood should be taken off, but sufficient must be left to afford shade for the buds. The operation is best carried out in dull weather, and the buds should not be too far advanced. As soon as the tree is budded, all other growth must be taken off as it occurs, or the buds will not take.

On this subject Mr. A. H. Benson says:—"I note with interest that Mr. Bunnage has been successful in budding the mango, and agree with him that for the operation to be successful the tree to be budded must be in full growth. I should not, however, consider it advisable to cut back the tree that is to be budded before the union of the bud and stock has taken place, as there would be a danger of flooding the bud with too much sap, and consequently preventing a union. I have seen a mango-tree successfully budded in Mackay, and have succeeded in budding young seedling mango-trees myself. Unlike Mr. Bunnage, I would prefer the buds to be plump and fully developed; in fact, just ready to start into growth."

SUBSTITUTE FOR PARIS GREEN.

A fruitgrower, speaking at the annual meeting of the Western New York Horticultural Society, stated that he had found arsenite of lime as a spray superior to Paris green. Besides being cheaper, it remains in suspension longer. The wash consists of 1 lb. white arsenic and 10 lb. lime to 400 gallons water. He urged the necessity of spraying apple-trees before they blossom.

With regard to Bordeaux mixture, Professor Beach, of the Geneva (New York) Experiment Station, said that Bordeaux mixture should not be used after it has been kept as a mixture over forty-eight hours.

Commenting on the above, Mr. A. H. Benson says:—"Arsenite of lime is the active principle of London purple. I presume that the 10 lb. of lime is caustic lime (unslacked stone lime), and that the 1 lb. of white arsenic is boiled with it; if so, this will form an arsenite of lime, which is a deadly poison to all leaf-eating insects when sprayed on the foliage. Bordeaux mixture

should be used when made, and not kept. A stock solution of bluestone and a stock solution of milk of lime can, however, be kept and mixed together to form Bordeaux mixture as required."

In a Bulletin (No. 13), January, 1897, on "Spraying," issued by this Department, Mr. Benson gives the following directions for preparing Paris green and Bordeaux mixture:—

BORDEAUX MIXTURE—A FUNGICIDE.

Winter Strength.—6 lb. bluestone, 4 lb. of unslacked lime, 22 gallons of water.

Summer Strength.—6 lb. bluestone, 4 lb. of unslacked lime, 40 gallons of water.

Prepare as follows (for the 40 gallons solution, the 22 gallons solution in proportion):—

1. Dissolve 6 lb. of bluestone in 20 gallons of cold water in one cask, by placing it in a bag and suspending it in the water.
2. Slack 4 lb. of unslacked lime in another cask slowly by first pouring about 3 pints of water over it. This will reduce the lime to a thick cream free from lumps. Water should now be added, stirring well till there are 20 gallons of milk of lime in the cask.
3. Stir the milk of lime up well, strain it and pour the whole of the 20 gallons of milk of lime and the 20 gallons of bluestone water together slowly into a third cask, stir well for three minutes, and if properly made the mixture is fit for use.

The mixture is much better if made in this manner than when a strong solution of bluestone and lime is first mixed together, and water to make up the required quantity is afterwards added.

In order to see if the mixture is properly made, plunge the blade of a knife into it for a minute. If the knife is untarnished, the mixture is all right; but if the knife is stained a coppery colour, then more milk of lime must be added.

The mixture should always be neutral, as if there is an excess of bluestone it is apt to injure the foliage. Use water that is free from iron, and do not make the mixture in iron, zinc, or tin vessels of any kind—wood is the best.

If desirable, a stock solution of bluestone may be kept on hand for use as required. Such a solution may be made by dissolving 100 lb. of bluestone in 50 gallons of water. Place the 100 lb. of bluestone in a bag and suspend it in the cask of water, and in the course of a couple of days the whole of the bluestone will be dissolved, and each gallon of the solution will contain 2 lb. of bluestone.

To make the 40-gallon solution you therefore take 3 gallons of the stock solution of bluestone and add 17 gallons of water to it to make up the 20 gallons of bluestone solution for mixing with the 20 gallons of milk of lime as previously described. A stock solution of milk of lime can also be made, but it is better to make it as required.

Bordeaux mixture is a fungicide, and it is of little value as an insecticide. It, however, combines well with arsenical poisons, in which state it is a very good combined spray.

INSECTICIDES.

Paris Green.—This is the best remedy for all insects that actually devour their food. It is a powerful arsenical poison, and a good sample should contain at least 50 per cent. of arsenious acid. It is generally used by itself, but if desired it can be used with lime, in the proportion of 1 lb. of Paris green to 4 lb. or more of lime. Mixing it with lime tends to make it less dangerous to handle, and will not interfere in any way with its action. It can also be used in conjunction with Bordeaux mixture. The best way to mix Paris green with water is to place it in a cup or billy with a little cold water and thoroughly moisten every particle the same way as mustard is mixed up for table use; then add more water gradually, stirring well whilst doing so, till it is thoroughly

Plate CIII.

ARAMON (One-half natural size).

mixed; then add the requisite quantity of water. Paris green is used at a strength not exceeding 1 lb. to 160 gallons of water. It must always be kept well stirred whilst in use. It must not be sprayed on during rain, sunshine, or heavy drying winds. It should not be applied to either fruit or vegetables within a month of the time of gathering. It should be handled with care, and kept out of the way of children. It should always be applied as a very fine spray, and persons spraying should take care not to inhale too much of the spray.

Note.—400 gallons of water American measure is only equal to 320 Imperial gallons.

Viticulture.

A DESCRIPTION OF SOME VINES GROWN AT THE GOVERNMENT STATE FARMS.

By E. H. RAINFORD,
Viticultural Expert.

This Department of Agriculture has collected together a number of fine varieties of vines, many new to this colony, some already known, with a view to propagating and distributing the same to vignerons and others interested in grape growing. The collection comprises some fine table grapes, some new French wine grapes, and some varieties of Portuguese and Spanish grapes, grown in those countries for the production of port and sherry. Of these latter, there are few, if any, representatives in Queensland, and the tests made at the State Farms as to their adaptability to our climate will be of considerable interest to vignerons. Queensland ports and sherries are at present made from French and American varieties of grapes, and are lacking in the qualities peculiar to those wines.

No doubt soil and climate account for much in the character of a wine, but it is equally true that a wine made from grapes of Portuguese and Spanish origin will approach nearer to the type of the wines made in those countries than when made from French or American grapes. Some of the French vines are not to be met with in this colony, and will form a valuable addition to the vigneron's collection, notably some Bouschet hybrids with a red juice, valuable for those districts where wines are lacking in colour, as the quality of the must is much superior to that of the Lenior or Jacquez. As already mentioned, some of the vines in the collection are already to be found in Queensland, but deteriorated in quality from climatic and other causes, so that an infusion of fresh blood, as it were, will likewise be of service. Threatened as we are by a severe competition from the South, if Federation is accomplished, any steps taken to assist Queensland vignerons in improvement of quality and crop, will doubtless be appreciated by them. Many of the table grapes are of new varieties, and fine croppers in Europe, and some are grown especially for commercial purposes, being good travellers and not easily damaged.

It is proposed to give a description of one or two varieties every month in the *Agricultural Journal*, with some remarks on their characteristics. When possible, a plate will accompany the descriptions, taken either from a photo. of the fruit, or reproduced from other sources.

NO. 1—THE ARAMON.

Synonym: Ugni noir.

Very vigorous and spreading grower.

Leaves.—Large, slightly indented, supple, glossy above with slight webby down below. The petiolar or stalk indentation open.

Bunch.—Large, long, rather loose, slightly shouldered, with a brittle stalk.

Berry.—Large, round, juicy, pleasant flavour, dark red to black; grand cropper.

Remarks.—This vine is much esteemed in some districts in France for its great cropping powers, as, with intense cultivation, it gives 10 tons and over to the acre. This grape is much used for making white wine of a Chablis character, exported largely to England. The grapes have to be quickly crushed and pressed to avoid any colouring of the juice; about 60 per cent. of the must being turned into white wine and the remainder into claret.

The Aramon makes a light clean red wine of rather low alcoholicity, from 15 to 19 per cent. of proof spirit, but undoubtedly in this climate the strength would increase considerably. This grape would be very useful both for making light white wines and for mixing with coarser varieties for clarets; its cropping powers also recommend it.

It resists disease well.

Botany.

PANICUM COLONUM.

Mr. H. Tardent, Manager of the Biggenden Experiment Farm, sends us a specimen of a grass which is apparently unknown to stockowners generally, and gives the following account of it:—

We often import at great expense and trouble foreign grasses and plants. This is right enough in its way. But I am inclined to think that often better results would be obtained by cultivating and improving some of our indigenous grasses which for æons past have adapted themselves to our soils, climate, and circumstances. When visiting farms in this newly settled district (Biggenden and the surrounding neighbourhood), I was struck by the luxuriant appearance of a grass which was quite new to me. It is leafy and succulent, stooling well, growing very thick, and reaching from 3 to 5 feet in height. It is mostly found on rich land, such as, for instance, old sheepyards and camping places, and in one instance at least I saw it healthy and thriving well at the bottom of a hill where there was a soakage, rendering life impossible for corn and other plants, which were there stunted, yellow, and dying out. A local dairyman of great experience (Mr. Fowler) told me he considered the grass unsurpassed as a cow fodder.

As nobody in the district could tell me either the vernacular or the botanic name of the plant, I sent a handful of it to the Government Botanist (Mr. Bailey) who writes thus about it:—"The grass of which you forward a sample is *Panicum colonum* (Linn.). It is indigenous in Queensland and most tropical and sub-tropical parts. In India it is considered one of the best for fodder, all kinds of stock being fond of it, and the abundant quantity of grains which it produces is considered to add greatly to its nutritive qualities."

Mr. Bailey adds that it is not so widely spread as a close ally, the *P. crus-galli*, but is probably better, and would be more easy to manage in cultivation, requiring, however, a good and *probably damp soil.*

From what I have seen so far of the grass, it seems to me to be a summer fodder, coming into seed in February and March. When depastured or mown down, it grows again very rapidly. I think it would stand a great amount of moisture, being thus well adapted for dairymen to grow on the coast during the wet season.

At Mr. Bailey's request, I am now gathering some seeds of it for distribution to those desirous of giving it a trial on a small scale. One should be careful, though, to keep it well under control. Like all good fodder grasses, it is likely to become a nuisance amongst other crops. It does not extend by means of rhizome roots, like couch or Johnson grass; but its tiny seeds are very numerous and shed easily, so that it becomes difficult to eradicate it once it has got established.

[On Plate CIV. we give an illustration of this grass. We should be glad to hear from anyone who may have had experience of the grass as a fodder or otherwise.—Ed. *Q.A.J.*]

Plate CIV.

PANICUM COLONUM.

[illegible]

[illegible]

Apiculture.

Our Queensland bee-keepers appear to be satisfied to jog along in their old groove without troubling themselves to make investigations, or, if they have done so, without giving themselves the further trouble of helping neophytes in bee-keeping by publishing any valuable results they may have arrived at. Such supineness, and we may even say selfishness, is nothing less than culpable. Every new departure in the affairs of rural life should be ungrudgingly imparted to the general public. We have several times invited bee-keepers to contribute to the *Journal*, but without success. They prefer not to advertise themselves or the products of their apiaries. Great Britain imports yearly between 2,000,000 and 3,000,000 lb. of honey, and the average price realised is about 3¼d. per lb. Is not some of this trade worth catching? Amongst the countries engaged in supplying the markets with this product the principal are Chili, the United States, Peru; amongst the minor contributors are the British West Indies, France, Canada, Germany, Italy, and the Spanish West Indies. Australasia also contributes in a small degree. Why should not Australasia contribute as amongst the principal suppliers? Here there is no hard winter. Honey is produced all the year round. Australia abounds with honey-producing flowers, both indigenous and imported, yet our exports are small, and they are stigmatised as flavoured unpleasantly with eucalyptus. So far as Queensland is concerned, the fault lies with the bee-keepers themselves. They seem to have no enthusiasm in their business, and to be content to "let things slide." If they would see apiculture a success, they should try to force success, and not rest content with a verdict which is untrue in most cases. Queensland honey is as good as any produced in Australasia, and should command a price in the home markets which would repay the producers for their outlay. Much lies in the general get-up of any product placed on the London market. Honey may be excellent; cornflour, banana-meal, arrowroot, &c., may be of the finest quality; but, placed on the home market in a kerosene tin, nobody would look at it. Let our producers study the style of the get-up of articles put up for export in Great Britain, France, and Germany, and compare that style with many of their own, and they must recognise that, if they fail to catch the home buyer, the fault lies in the carelessness with which their various products are prepared for export.

"The Drone," in the *Australasian*, whose writings on apiculture are deserving of careful perusal by all interested in bee-keeping, has the following on a series of questions asked by an anonymous writer under the pseudonym of "Bloodwood":—

"Bloodwood" writes, asking a series of questions which will be of interest to many more than himself. I shall, therefore, quote from the letter in full. He writes:—"What is the recognised and proper course to adopt when one wishes to secure strong working colonies, in anticipation of a good honey flow?" The course adopted by most bee-keepers now is to leave a sufficient supply of honey in the hives to last them through the winter months. In Australia, where no wintering is necessary, bees can be left safely with 25 lb. of honey in the hives, calculating eight frames, Langstroth size, to carry that amount as well as brood. If stimulating is desired, feed the bees early in spring on sugar, ground to powder (with a glass bottle or roller, on the table), mixed with honey till it becomes solid, and will not run.

"Bloodwood" continues:—"I find that my bees do not seem to favour the supers, for, when I supply them, using the queen excluders, the bees almost wholly remain in the brood chamber, and give off their surplus energy in the shape of swarms, instead of in garnering honey. I have arrived at quite a sufficiency of hives, and would like to restrict the swarming instinct, in order

to secure more honey." All bee-keepers will say Amen! to the above. The swarming instinct is one of the distracting puzzles that make bee-keeping so aggravating and yet so interesting. Bees ought not to swarm—everything seems right, lots of room to work in, and flowers all around. Yet, despite all this, given a good season, and out come swarms from 7 lb. weight to a cupful. I use the Heddon hive, and no queen excluders. This hive is half the size of the Langstroth in body and frame, and can be built up to five or six bodies if desired, or 3 feet high. The two bottom bodies are rarely extracted from, unless the whole are being filled up with honey, leaving no room for the queen to lay. One of the advantages of the Heddon hive is that the frames are self-spaced and fit tight together, and the bodies can thus be turned upside down without displacing the frames. Mr. Bolton, of Dunkeld, has discovered that turning the hive upside down destroys queen cells and prevents them from hatching. His method of preventing swarming is simply to keep on turning the hives upside down every eight days, while the swarming fever is on the bees. This is the simplest and most perfect plan yet devised. I should advise "Bloodwood" to remove his queen excluders, and wedge his frames so that they will not slip, and trying turning his bodies upside down. Then a weekly examination will show whether fresh queen cells are being formed. Doolittle prevents swarming by caging the queen in the hive; ten days afterwards he removes the old queen, and places in her stead, in a cage, a young queen with candy at the entrance of the cage. The bees eat the young queen out, and she is supposed to go upstairs at once and murder her rivals. This is not so simple, neither is it so effective, as Bolton's plan, and I go for the latter.

The final part of "Bloodwood's" letter I quote in full, as it is most interesting:—"Is it a common occurrence for two queens to inhabit one hive in apparent peace and harmony? Recently I secured a swarm which had romped away about a quarter of a mile, and in due course expected to find that the queen was proceeding to increase the number of her subjects, but frequent observation was attended with negative results. The queen seemed to be well grown and as pure-bred an Italian as her parent. One day I thought that she had performed a very smart feat in flitting from the frame that I had looked over to the next that I withdrew, and eventually I discovered that there were two queens in the hive. I caught one and transferred her to a queenless nucleus. Eggs shortly appeared in the original and the nucleus."

I have caught six young queens in a swarm, but I have never yet made as interesting a discovery of this nature as "Bloodwood" has done. I have read of two queens in one hive, and I believe it is a simple matter to keep two queens alive in one hive with queen excluders between the stories, but I have never gone in for experiments in this direction. Next time "Bloodwood" strikes a patch like that, he should leave them alone and note the result. A queen here or there is nothing to gain or lose in comparison with the interest to be derived from watching the final results of two living together.

ABOUT BEES AND HONEY.

FOR several years past Great Britain has imported annually 2,250,000 lb. of honey, which, valued at 3½d. per lb., amounts to about £31,000. One-third of this, according to the "Board of Agriculture Journal," comes from the United States; another third is provided by Chili and Peru, and the remaining third from Germany, France, Italy, Canada, Australia, New Zealand, and the British and Spanish West Indies. The yield of honey in the United States has been estimated at 553,000 cwt., and of wax at 10,000 cwt., but no returns have been furnished since 1890; still it is known that the production and export have increased since then. France produces 17,000,000 lb. from 1,623,054 hives, Russia 321,000 cwt. from 2,000,000 hives; but the whole of this is retained for home-consumption. Canada, in 1896, had 160,076 hives, valued at

£170,000. New South Wales possesses 41,900 hives, yielding 1,378,000 lb. of honey and 31,800 lb. of wax. In Queensland there are 19,178 hives, yielding an average of 48 lb. per hive. Some 60,000 lb. have been exported in a single year (1892), but exports have been very much reduced of late. In some districts, such as Killarney, on the Darling Downs, Rockhampton, in the Central District, and Brisbane, in the Southern, the averages per hive were respectively 94 lb., 94 lb., and 65 lb., whilst at Maroochy the average per hive was 62 lb., Nerang, Logan, and Caboolture showing the poorest result—viz., 34 lb., 36 lb., and 44 lb. In Western Australia, the production of honey has not yet met the requirements for home consumption. The Western Australian honey is reported upon by Mr. R. Helms, Biologist to the Department of Agriculture, as equal to the exceptionally noted samples of the world, and superior to the average produced in the other Austrālian colonies, yet honey in bottles and tins is imported to the value of over £3000 per annum.

South Australia in the year 1896-97 had 17,553 hives, which yielded 898,358 lb. of honey. But in the following year there was a decrease of 7,861 hives, the agricultural statistics showing only 9,692 hives, with a corresponding decrease in yield, only 155,665 lb. of honey being produced. We have no statistics as to the present production of honey and wax in Victoria.

The profits of bee-keeping in this colony as compared with the profits made in Great Britain by British apiculturists are widely different. A cottager who keeps half-a-dozen hives, yielding an average of 50 lb. of honey each, can sell the produce at 1s. per lb. Thus the six hives bring in a yearly sum of £15, far more than enough to pay rent and taxes. In Queensland a farmer who possesses a few hives will not obtain half that price for his honey, still what he does make is nearly all profit, and in addition to the value of the bees as honey producers, they are valuable aids to the fruit-grower in assisting to fertilise the blossoms. The wax is not to be forgotten as a commercial product. It is, however, reckoned that to produce 1 lb. of wax from 8 to 10 lb. of honey are sacrificed.

Now a few words about ripening honey, and we cannot do better than to quote from the utterances of Canadian beekeepers as expressed at a meeting of the Ontario Beekeepers' Association held in December, 1898, in the city of Hamilton. One of the questions raised at this meeting was the adulteration of honey. One speaker says:—"If you go into the stores of Ottawa, fall after fall, you find that the honey put upon the market by local men there is largely put up in pickle bottles and corked, and all you have to do is to turn that bottle upside down to see that it is exceedingly thin and there is a large percentage of water in it; and when the consumer puts that upon the table the result is that he is not pleased with the honey as he should be. Many are not aware as to what the trouble is, and the result is that the consumption of honey is curtailed by putting such an article upon the market. These men who put their honey upon the market before it is properly ripened are simply feeding and living upon the good reputation which the better article has gained throughout the Dominion. The price of honey is reduced by putting such an article upon the market, for it costs more and is a greater expense to produce an article with a heavy specific gravity."

Another says:—"Some races of bees will not give heavy honey, and how are we to get over this difficulty? As far as the percentage of water in our honey is concerned, I am afraid that we will have to kill a lot of our bees—and perhaps it is better that we should kill them. I find such a difference in stocks of bees sitting alongside of each other, feeding in the same field, and, we suppose, from the same food. One gives a heavy, smooth, oily production, and the other is a very thin, watery production. One will keep and the other will not. The watery honey has just as fine a flavour as the other, but it deteriorates. It is rather a difficult matter for us to get over."

Mr. Shutt, chemist at the Dominion Experimental Farm, Ottawa, was asked for an opinion on the subject, and said: "From what I remember of the subject, however, the English analysts have said that the percentage of water

in honey is subject to certain fluctuations, within certain small limits, and that usually the percentage of water in genuine honey varies between 18 and 20 per cent. There have been examples in which the water has far exceeded that amount, however, and I believe there are genuine honeys with as much as 25 per cent. of water. So that I presume that what Mr. Holtermann is speaking of, and what he wants legislation for, is to prevent the sale of honey when the percentage of water it contains exceeds, say, the latter quantity, 25 per cent. I should judge 25 per cent. as an outside limit, because I know in England that 20 per cent. is looked upon as a good average percentage of water in honey. You would be quite safe, I should say, in putting it at 25 per cent., and consider honey containing more than that as adulterated. The law you refer to is an adulteration law. When the law comes to treat of the matter it will call additional water, whether left in or added, an adulteration; it could not speak of it by any other term."

Another speaker, Mr. J. B. Hall, said that no test was required; if a honey were obtained which would weigh 12 lb. to the wine gallon, no analysis was necessary. In taking extracted honey the quantity could be doubled if taken unripe. This much was certain: If the comb honey of two hives of bees alongside each other were taken, gathering from the same field, one will be a beautiful waxy honey and and the other will be very thin; if you put a pin into the cappings of the comb it will empty every cell. That was something he could not account for, unless it were the race or stock of bees that did the trick.

The President said that samples of honey had been supplied to the Revenue Department, and pronounced to be genuine honey with such percentages as the following:—23·50, 25, 21·40, 26·20, 22·80, 26·90, 21·30, 24·90, 24·21, 25·30, 27·40, not clear; sediment observed, adulterated with starch glucose.

Every beekeeper, it was said, could test his own honey, and he could ascertain, to his own satisfaction, the amount of water it contained.

If a sample of honey were taken that would test 14½ lb. per gallon, imperial measure, and add 28 lb. ot water to it, there will still be a mixture that will weigh 13¼ lb. per gallon.

There was really no such a thing as honey. This might be news to beekeepers; but there was really no actual element by the name of honey.

True; but there is no element of the name of pork or butter; but we have a compound made of different things, and that varies in different honeys in proportion. The proportion of these things mixed together varies in honey, not only from year to year, but from locality to locality; these specific gravities all vary; it is greater in some, and less in others. Water has one specific gravity, glucose has another, grape sugar has another, so has cane sugar, and these are all in honey.

To this, Mr. Shutt replied—

"The fact that the specific gravity test gives the same result as to the percentage of water needs some qualification. If the honey has had no sugar, glucose, or syrup added to it, then the specific gravity test will give you the percentage of water, or the percentage of honey sugar in it; that is, supposing the only adulteration suspected is that of water; but you can easily understand that if such materials as I have mentioned had been added to honey to adulterate it, then the specific gravity would not necessarily give you the percentage of water in the honey. If you are not looking for the percentage of water only, and you can assume that the rest of the honey is genuine as prepared by the bees, then the specific gravity test will give you approximately the data that you wish, the same data that you would obtain by analysing the honey and ascertaining the percentage of water. There were one or two remarks made by Mr. Darling that I should like to correct, for I must not go on these minutes as being misunderstood. When I was spoken to with regard to this question I do not speak as an authority, and I mentioned the fact that I was not quoting from memory, and that I had not come prepared to speak authoritatively upon the subject. Mr. Darling misunderstands me when he

thinks I suggested a standard. I am of opinion that we have not sufficient data as yet to establish a standard. I said that I believed in England they held that genuine honeys contain somewhere in the neighbourhood of from 18 to 20 per cent. of water, but that there were genuine honeys on record which ran as high as 25 per cent. What I say is, that if there are sufficient data to show that genuine honey does not reach beyond a certain limit, then legislation may fix that limit by law. It is a question of chemistry entirely. It seems to me that the data that has been put forward in that bulletin constitute our only collection of Canadian data on this subject; it is an extremely valuable investigation, but it has not been taken up with the point in view that we are discussing, and it probably therefore will be highly desirable to have such a committee appointed as Mr. Holtermann has suggested, to secure samples of genuine honeys from various sources over large geographical areas, at points distinct from one another, and samples of honey elaborated by different races of bees, and from different kinds of flowers, basswood, clover, &c. The analysis of these samples would show if any conclusions can be arrived at, if any deduction can be made, as to this question of the percentage of water in genuine honey. Would there be any injustice if a limit were fixed? You must know that milk fluctuates much, and there are on record plenty of cases of genuine milk which would be accounted adulterated by law. If milk is sold in a city with 2½ per cent. butter fat and 8 per cent solids not fat, the law says that it is adulterated; the man swears that the milk is just as it came from the cow; the law says, we cannot help that, the law has fixed a standard and the milk falls below it. I mention such a case as an illustration. If you take the milk of the whole herd it would come up to 3 per cent. of fat, the limit, at least, but isolated cases might very occasionally fall below it. In regard to that word 'genuine' in Mr. Macfarlane's report, I am not here to interpret it; I hesitate to do it. But I doubt if he used that word 'genuine' with respect to the percentage of water in that honey. What I think he meant by that word was that it had not added to it glucose, syrup, cane sugar, or other saccharine matter. I think the idea he wished to convey was that no extraneous sugars or sugar compounds had been added to that honey."

After some discussion, one member said there was a great difference in the specific gravity of different honeys. In regard to 18 and 20 per cent., genuine honeys run from 18 up to sometimes 30 per cent., and if a standard could be fixed of, say, 25 per cent., there would be no particular harm in doing it. As far as the percentage of water was concerned, the public knew that there must be water in honey.

There appeared to be an opinion that honeys gathered in a wet season differed materially from those gathered in a dry time. In a very hot, dry season, the honey was fit to go on the market within two days of its being gathered, whilst in a wet season it must be kept from four to six weeks, and then would not be a good marketable article.

On the question of feeding bees with honey or cane sugar a lively discussion was raised, and at its initiation Mr. Shutt said:—

"I would like to ask information as to whether there is any difference noticed in the strength of bees that are fed on the one hand with honey, and on the other hand with sugar syrup made from ordinary cane sugar. There is a very interesting question involved there; bees, like all animals, require a certain amount of nitrogen to replace the waste of their tissues; that is absolutely necessary. Honey does not contain any nitrogen, but honey does contain a certain quantity of pollen, and I take it that the small but necessary quantity of nitrogen that the bees require to keep up the waste of their tissues they get from the pollen. Of course, the sugar of the honey is burned by the bees with the aid of the oxygen of the air they breath. The burning of it is similar to the burning of a piece of wood in the stove, and produces heat and energy within the bee. At the same time, there must be a small quantity of nitrogenous substance to keep up the waste of the tissues, and I wish to ask as to the source from which bees obtain this nitrogenous material."

In answer to this, it was stated that the nitrogenous matter was deposited by the bees and protected with honey, with a cap over it.

Admitting that the bees had no access to pollen, would they not do better in honey than on cane sugar? The concensus of opinion was that they would do better on honey.

Another question raised at the meeting was whether it was profitable to save propolis to extract wax from. The general opinion was that there was no object gained in saving propolis and that to get wax from it there must be small quantities of wax on the frames. When wax was to be extracted from it, it was put into the "solar extractor"; the propolis stayed on the tin of the extractor and the sun melted the wax, which ran away and caked.

Section honey was next considered, and on this subject a member said:—

"When we commenced taking comb honey first we had no bee space in our sections, and we had no separators between our sections. We had no comb foundation to put in them, and we used to get some fat sections and some lean sections and the fat ones looked very nice; everyone wanted a fat section, and when we crated them and supplied them to the retailer that was where the difficulty largely came in, which will come in with these new sections. We, as beekeepers, can handle them without making them bleed, but we put them into the hands of the storekeeper who does not know anything about bees, and who handles a package of honey as he would a package of coffee, and he makes them bleed. I found that with no separators, although I think it is nicer myself, it gave a good deal of trouble to those I sold it to, and when I went to sell them honey, they said: 'I don't want to touch the stuff, it dirties up everyone, and I wouldn't have it around.' What are you to do in this case? We have got to guard against that and that is why we have separators, so that our honey stands back from the wood and when you pull out one from the other, there is $\frac{5}{16}$ of an inch between the surface of one comb and the surface of the other; and that assists these very clumsy or ignorant people who do not care about bursting the cells of the comb in keeping it clean."

The conversion of honey into vinegar met with adverse criticism. Honey vinegar was the best of all vinegars, but it did not pay to make it. It had to be made by the addition of alcohol. As one facetious member put it: "If you are going to make it for fun, it is all right; but if you are going to make a profit out of it, you had better quit. It will cost more than it is worth."

Mr. Shutt read a paper on "Foundation Comb." Briefly, in supplying foundation to the bees, the object is to save much of the expenditure of food and tissue in the formation of wax, allowing the bees more time and energy and material for the production of honey.

"I argued," says Mr. Shutt, "that that foundation would be the most profitable to use which the bees could utilise to the greatest extent in this way. That was my deduction. In other words, those foundations to which the least wax was added by the bees in building comb would be the most economical.

"Now, it will be necessary for me to explain somewhat the method of our procedure. A certain number of foundations were submitted to us. I ascertained accurately the weight of a 2-inch square piece of each. We did this by means of a stamp or die made exactly 2 inches square, stamping out of each of the foundations a piece or several pieces—ten pieces. From the weight of these the average weight of 2 inches square of the several brands of foundation was obtained. At the close of the season the caps of the cells were carefully removed, the honey was extracted by an extractor, and the combs soaked in water to remove the last traces of honey. They were allowed to dry spontaneously, just by exposure to the atmosphere. In that way we got rid of the last traces of honey found in the comb. Then we took this very same dye and stamped out from the empty comb 2 inches square and weighed it. The results I will now read in detail; they are tabulated and show the weight of the foundation and resulting comb in grammes.

"The tables show the original weight of 2 inches square of foundation, and also give the weight of the same area of empty comb at the close of the season.

From these data I was able to calculate the percentage of wax that was added by the bees to these respective foundations. I found that such percentages varied greatly; in some foundations the bees added only 75 per cent. of wax, whereas in others the percentage went up to as high as 175 per cent. When we supplied a heavy foundation the percentage of wax added was the least, and when we furnished the bees with the lightest foundation the bees added the largest percentage of wax. Thus in "Foundation in general use," (the name of one brand foundation supplied to us) we found that the percentage of wax added in round numbers, was 75 per cent.; in the "Patent process," 12 square feet per lb., the wax added was 175 per cent We may consider one or two as examples or illustrations: The "Foundation in general use," 2 inches square, weighed 1·41; the wax that was added by the bees was 1·15; in the case of the "Patent process," 12 square feet per lb., the weight of the foundation furnished was 1·00; the weight of the wax added by the bees was 1·76. The first conclusion, therefore, I was able to draw from that work was that the weight of the wax added by the bees was inversely proportional to the wax supplied in the foundation. I do not mean to say by that statement that they all vary in the same proportion; such a deduction is not possible from our figures, but it is very evident from these three years' experiments, because the two following years corroborate what I am saying now, that to the lightest foundation the largest amount of wax has to be added. When we furnish a comb containing a larger quantity of beeswax then there is a less quantity of wax added to it by the bees. If our object, then, in furnishing foundation comb to the bees is to allow them time and energy for the production of honey which otherwise would be given to the production of beeswax, it will be more economical to furnish heavy foundation than a very light one. That is one of the deductions we were able to draw from the first year's experiments.

"Acting on the supposition that that was the main object in furnishing beeswax, I said that it pointed to the economy of supplying the bees with a foundation of not more than 7½ or 8 feet to the pound. That was what our results showed. In other words, when you employed a foundation which occupied an area of 15 square feet to the pound, then the bees had to supply a very much greater amount of wax in building the cells than they did when you supplied a wax foundation of 8 or 9 square feet to the pound. There were several other points noted and which are of some importance to you. For instance, when we started with a darkly coloured foundation we found that the dark colour remained and that there was a heavy and unsightly "fishbone," as it is known, in the resulting comb, and I suppose that that materially affects, if not the quality, at any rate the sale of the comb honey.

"If it is true, as I have said, that the wax furnished by the bees is inversely proportional to the wax furnished them in foundation comb, are we justified in carrying that argument to its logical conclusion? Should we endeavour to furnish all the wax for the comb? Now, I do not think that possible, and to bring before you my reasons for thinking so, I should like to recall to your mind what I said with regard to the production of wax—viz., that it is not collected by the bees, it is a normal function of certain cells in the bees, and I doubt very much if we could so alter the constitution of bees so as to direct all their energies towards honey making, and to entirely give up and abandon wax production. I believe, therefore, that there is a limit wherein it will be economical for us to supply the amount of wax, but we should not go beyond that limit.

"Then, another point that was brought out during the second year's experiments was that the deposition of wax varied according as to whether clover or buckwheat honey were stored. This is a matter that I have not seen noticed anywhere; it probably has not hitherto received the attention of any scientific investigation. We found invariably that the comb which stored buckwheat honey was heavier than that which stored clover honey. When we take the same brand of foundation and supply it to bees gathering clover honey and to

bees gathering buckwheat honey we found invariably that there was a very much larger amount of added wax in the case of the buckwheat than in the case of clover."

We next come to the question of a market for honey, and of the prices obtainable.

So far as the profit in beekeeping is concerned in Canada, Mr. Couse, Secretary of the Beekeepers' Association of Ontario says, in allusion to an apiculturist who runs 1,200 colonies of bees:—"His production of honey is very large, but he does the work pretty nearly all himself, with the aid of a hired man and a boy, and there is very little expense in handling 1,200 colonies of bees. I suppose he has come to the conclusion, like a good many more, that the price of honey is so low that, unless we produce an immense amount, our returns are very small: therefore we must increase our apiaries if we are going to stay in the honey business. The price of honey now has dropped so low that a man with 100 colonies of bees dare not depend upon them for a living."

The beekeeping industry is usually connected with something else. If a man thinks of going into the business to make a living out of it, he has now got to be an expert beekeeper and handle an immense number of colonies to make a reasonable living. Therefore we must, if we are going to go on in beekeeping, find a market for our honey, and I think a matter that ought to receive a good deal of attention at the present time is, how many colonies a man can handle, and how much honey he is going to produce, and what he is going to do with it.

Many people say in Canada that if they can get 6 cents (3d.) per lb. for their honey, and are able to sell the entire crop, they will keep more bees. It was stated that there was a large opening for honey sales in Germany.

The Californian honey is sage honey, which is white, but is said to have a minty flavour.

This is what Mr. McKnight said at the meeting about prices in Canada as compared with those obtainable in Great Britain:—

"Heather honey is as dark as golden syrup. It is a very peculiar article; there is no other honey like it. It cannot be extracted; there is that peculiarity about it; and notwithstanding that, it commands the highest price in the British market of any other honey. I am, perhaps, the only man here that has a personal knowledge of the British honey market, or at least, I had. At that time it was very strongly urged by some of our members that we should export our honey; and it was not only urged that we should export it, but that we should contribute a certain amount of our Government grant for that purpose. I opposed that, as some of you will remember, because I knew it would not be in the interests of honey producers of Ontario, knowing as I did what they might expect for their honey over there. I saw it would be a fatal thing indeed for them to undertake that. I was getting from 12½ to 15 cents (6¼d. to 7½d.) a pound; I knew very well then, and I know it now, and my opinion expressed then is borne out by the evidence Mr. Holtermann gives you to-day, what you can get for your honey in Great Britain—that you can sell all the honey that you want to send there. I knew then and I know now, that you cannot expect to get a return of more than 7 cents (3½d.) a pound for it; you could not get it then and you cannot get it at the present day. Is it advisable under the present conditions to send your honey over there and take all the risk of sending it, take the risk of losing it entirely through a dishonest commission man, take the risk of breakage, and all the rest of it? Far better for you to sell your honey in Canada. I may add that there is an unlimited market in this country as far as our production goes. We are selling honey to the public to-day, and we sell them 2lb. of honey for what they can get 1 lb. of butter for, and if the matter is properly pushed you will find a sale for your honey. Everybody knows that the general consumption of honey in Canada is one hundredfold more than it was 15 years ago, and I believe it will still go on. My advice to you is, so

long as you can find a satisfactory market at home sell your honey at home. I said I knew more about the condition of the British honey market than any man here. It is from personal experience. Some of you know I was one of your representatives over there when we sent over that magnificent display, the finest that has ever been made in the world, the finest and the best that ever will be made in the world again in our day. I visited all the principal cities in England, Ireland, and Scotland. When I was there I made it a special object to inquire as to the probability of an opening there for our honey. American honey at that time was sold, to my knowledge, on Market Lane, by auction, at 2d. a lb., when we with our Canadian honey, after expending 2,000 dollars in expenses, returned to every man who sent a pound of it, 10 cents (5d.) a pound for their extracted honey, and paid them for their package as well. Not only that, but I went to the largest departmental store in Britain (Lewis and Co., of Liverpool), perhaps the largest in the world, and talked honey to the foreman. He brought me down a 2 lb. tin of California honey very nicely put up, and it was very nice honey. I don't know whether it was sage honey or not. He told me he had bought that honey, and could get all of it that he wished to have at 3½d. per lb., or about 7 cents. I say again, and I repeat it to emphasise it, if you send honey to England you cannot, and you could not within the last 10 years at any rate, expect to realise more than 7 cents (3½d.) per lb. on an average for it. Will it pay you to do that and take the risk of it? I think not. I never knew a pound of honey sold in this country under 7 cents a pound."

HOW TO TAKE A SWARM.

A VERY simple contrivance for taking a swarm with little trouble was explained by Mr. McKnight as follows:—

"What I have used for 15 years is considered to be the best thing of the kind that is used anywhere. Its construction was not original with me; I saw it mentioned or described in *Gleanings* 14 or 15 years ago, and I was a comparatively young beekeeper at that time, testing nearly everything I saw that came along. This is a very simple and cheap contrivance. Those of you who were brought up in the old country will best imagine what it is like when I tell you it is on the principle of a chimney-sweep's brush, only a chimney-sweep's brush is wire, and this is made of wood. Take, for instance, a piece of stick 2 inches square and say 2 or three feet long, chamfer the four edges of it and make it octagonal in shape (eight-sided), cut off a few pieces of lath, rip your lath up the centre, cut them into pieces about 2 feet long, and nail them around on these eight bevels one after the other till you get it filled down well, 6 or 8 inches would be quite sufficient. At the other end cut a tin ferrule, put it on the stock with perhaps 2 or 2½ inches to receive the stick that you put into it. Have in your yard half-a-dozen or more different lengths of stick that will slip easily into this socket. When your swarm is clustering that is the best time to do it, but it does not matter; you can do it almost as well after it is clustered. You can see at once what length of stick is required to reach the cluster. Take the stick that you have in hand, put it into the socket, and as they are clustering put this in amongst them and they will cluster on it every time. I have taken swarms of bees off the top of a big old elm tree; simply by tying one on to the other you can reach away up to where the cluster is. If they are clustered, as very frequently they are, before you have noticed them, take your stick again and give a sudden jerk near the cluster of bees till you dislodge them from their resting place. I will guarantee to catch ninety-nine swarms out of one hundred with that simple contrivance. Having them clustered, then you can set your stick on the ground and take it away. When they are all settled upon your chimney-sweeping brush, lower your stick, drop the stick that was in the socket, carry home the swarm of bees to the front of your hive, and give it a sudden jerk and

there you are. I may tell you that when one of the prominent members of the British Beekeepers' Association was over here during the Chicago Exposition he stopped at my place for a while, and I was showing him this contrivance. It was in the morning, and I had little hope that I would be able to give him a practical demonstration of its usefulness. In going through the orchard, which was composed mostly of old trees—my bees were in the orchard—there happened to be what an Englishman calls a "cast," and evidently it had been there all night, and it was worth having. I took the stick and went through the simple operation with that little cluster, and in less than ten minutes the cast was upon my chimney-sweeper's brush. He was so much interested in it that he wrote me, and asked me to give him a full description. This device will not cost more than 10 cents, and a boy of twelve years old could make one. The only thing that costs anything is a tin ferrule, worth about 5 cents. I would recommend every one of you here to try it, and I believe if you try it one season you will never dispense with its use."

Tropical Industries.

MANURING OF TROPICAL PLANTS.

PINEAPPLES.

SANDY loam soils, but rich in humus, and with a hard-pan clay sub-soil, are best suited for pineapple culture. The roots of this plant generally run horizontally at a small distance (1 to 2 inches) beneath the surface of the ground, and, in order to prevent fertilising materials or atmospheric precipitations from penetrating into the deeper layers of the soil, the presence of a pretty high, hard-pan bottom is an important factor in the growth of the plant. Great caution should be exercised in clearing pineapple-fields of weeds.

Pineapples must be manured liberally with all three of the essential plant-food ingredients; they respond most readily to liberal nitrogen fertilisation; if lime is deficient in the soil, it should always be supplied before planting. No definite rules can be laid down as regards the forms in which the several plant-food ingredients should be applied. Animal fertilisers, guano, dried blood, bone-meal, cotton-seed meal, phosphates, sulphate of potash, and kainit can be employed as sources of nitrogen, phosphoric acid, and potash. In applying stable-manure or compost, care should be taken that these substances are brought upon the field in a well-rotted condition; as a general rule, all of the plant-food ingredients should be supplied in as soluble a form as possible. Fertilisers that are still fermenting are apt to destroy the delicate roots of the plant.

The plants should be set 1·8 feet apart; this will allow each plant sufficient room for proper development, at the same time forcing the leaves to grow in a more upright position, thereby affording the necessary shade to the plant during a portion of the day. Experience has shown that fruit from plants grown at the distance mentioned are not smaller than when the distance between the plants is 4·30 feet. Moreover, the closer setting out at distances of 1·8 feet helps to keep down the growth of weeds between the rows.

This fruit is apt to be attacked by the "red spider," a pest that is generally found upon the leaves at the germinal spot. For its destruction, Mr. Th. E. Richards, of Eden, Florida, recommends 18 lb. sulphur and 20 lb. lime, which are to be mixed with 24 to 26 gallons of hot water. This mixture is then diluted $\frac{1}{30}$ by adding cold water, and poured upon the plant at the germinal spot. The remedy should be applied as often as necessary.

FERTILISATION OF PINEAPPLES IN FORT MYERS, FLORIDA, U.S.

A field was manured with a mixture of—

1,000 lb. cotton-seed meal,
500 ,, kainit,
500 ,, superphosphate,
500 ,, equal parts of bone-meal and dried blood,
2,000 ,, cow manure,

of which 2,000 lb. were applied to the acre.

This mixture corresponds to a fertiliser containing 108 lb. nitrogen, 177 lb. phosphoric acid, and 78 lb. potash, the quantities of these ingredients applied to the acre being therefore as follows:—48 lb. nitrogen, 80 lb. phosphoric acid, and 35 lb. potash.

The field was planted at the beginning of June, 1892, after having been fertilised with 2 tons per acre of the mixture given above. Later the plants received a top-dressing of hen-manure; no record was kept of the quantities of this material applied.

The quality of the soil was light and sandy, corresponding to the typical Florida soil, which is considered of little value. The soil in question contained pretty large quantities of humus and sand at the surface, and had a hard-pan bottom at a depth of from 1 to 2 feet. As far as the physical properties of the soil were concerned, it was well suited for pineapple culture. In June, 1893, 5,000 pineapples worth 5 cents (£10 18s. 4d.) a piece were harvested, and in June, 1894, the yield increased to 11,724 per acre, worth 10 cents a piece at the Fort Myers market (£97 14s.). The yield is allowed in the report to have been a complete success.

SUGAR IN THE BARBADOS.

A late cablegram from London says that the sugar-planters in Barbados have rejected the offer of Sir Thomas Lipton to buy their cane at 10s. per ton in the event of his establishing his proposed central factories. They have suggested that in order to assist the sugar industry, legislation should be introduced on the lines of the Queensland Sugar Works Guarantee Act.

This refusal appears rather strange considering that sugar-cane is grown in Barbados under more favourable labour conditions than obtain at least in the south of Queensland.

The price paid for cane in this colony varies from 10s. to 15s. per ton, and from this is deducted 1s. 6d. per ton for cutting, from 6d. to 7d. per ton for loading into drays, and when further loading into punts or railway trucks is necessary another 3d. per ton is paid. Yet the Queensland sugar-growers, who sell their cane to the mill-owners, manage to make a good profit at the prices named. In the South, white labour at current rates of wages is employed, whilst in the North the work is mainly done by the aid of black labour. At the present day, however, black labour does not mean *cheap* labour, it really means *reliable* labour—labour which will not strike at critical periods, such as at cutting and crushing time. As far as actual outlay is concerned, the planters might as well employ white labour in the cooler portions of the colony, but it is pretty generally conceded, even by the opponents of black labour, that climatic influences militate against the white man in the open field in the far North, although there is abundant employment for them in the mill in the higher and more responsible work of manufacture. We do not know what rates are paid to the Barbadian labourers, but if, with coloured labour, it is found that the grower cannot make both ends meet when receiving 10s. per ton for his cane, then conditions must be vastly different from those in Queensland, where the cane farmer is satisfied with that price in certain parts of the colony. To give an instance: One planter at the Pimpama sold 50 acres of cane to the Nerang Central Mill, 12 miles from his farm. He agreed to accept 5s. per ton, the milling company cutting and carting his cane. The crop

reached 1,000 tons, for which he received £250. The season was a good one. The cane was past danger from weeds when he bought the property. No labour was required till crop time, so that the £250 was absolutely clear profit.

The 'Badians would do well to come and take a lesson from Queensland growers, and learn something about the Central Mill system here. True, that system is yet, to some extent, in the experimental stage, but it is tending in the right direction, as the mills are paying off their indebtedness to the Government, and are furthermore making large additions to their plant and to their tramway systems.

The Queensland crop generally averages from 25 to 30 tons per acre, which gives the farmer from £12 10s. in the South to nearly £20 in the North per acre.

In Barbados 13·6 tons of cane are required to produce 1 ton of sugar under the present system, and the net cost to produce that quantity of sugar is £8 12s. 2d. The current price of raw sugar being £8 8s. per ton, the consequence is that a loss of 4s. 2d. per ton is experienced. The yield of cane is much the same as in Queensland (25 tons per acre), but as sugar has been grown there for the past 200 years, the cultivation now has to be conducted very carefully and systematically, the soil being treated with artificial and other manures.

In Queensland the average cost of 1 ton of sugar sold is between £6 10s. and £7 10s., and the quantity of cane crushed for 1 ton of sugar is a little over 8 tons.

The price obtained for raw sugar last season was £8 13s. 4d., leaving a profit per ton of about 19s.

The returns and expenses naturally differ to some extent in different parts of the colony, but taken as a whole the above is about the situation in Queensland at present, and there must be some very exceptional conditions obtaining in Barbados if the planters there cannot make as good a living out of cane-growing at 10s. per ton as do the farmers in this colony.

FERTILISATION OF THE COFFEE FLOWER.

(BY J. C.)

A GOOD many planters who will recognise the above initials know that I am keen on the crossing of coffee. Wishing them and others to be equally keen in a work which may eventually lead to the advantage of the whole planting community, I venture to offer a few hints as to how the details of the crossing may be put in motion. The process of fertilisation, if confined to individuals of the same species, will only result in producing "varieties" of the individuals concerned. But when it is extended to different species of the same genus, then an intermediate class of plants called "hybrids" are produced.

As this may not be quite clear to all, I shall give a practical illustration. When two bushes of *C. arabica* are growing near to each other and flowering simultaneously, they will be observed to attract many insects of the winged class. It is a marvel where these insects come from in such numbers and at such short notice. But there they are, the whole day, hurrying to and fro from one bush to the other, until, perhaps, every newly-opened flower has been visited.

Now, although these insects have been most industrious in their own interests, collecting food and building material, the chances are that they have unconsciously rendered a signal service to the coffee also, by carrying pollen from the flowers of one bush to that of the other. If they have done this, inadvertently or otherwise, the insects have effected cross-fertilisation to the extent of producing varieties or new forms of the two bushes concerned. By excluding the services of the insects altogether, the same results, and even more effectual ones, can be secured by delicate manual operations. But of

this further on. The difference between the fertilising work of insects and that of man consists in its being promiscuous and haphazard in the one case and systematic in the other.

Now if individuals of two distinct species, such as *C. arabica* and *C. liberica*, were to blossom together in the manner described above, exactly the same activity of insect life would be observed, with, perhaps, similar results, only that in this case the progeny would be more than a "variety," it would be a "hybrid." Planters know that year after year their nurseries are stocked with seedlings, raised from local seed, of which a small percentage appear to be new varieties, or at least different from their fellows. They know also that Nature is herself responsible for such variation. If the life-history of a number of seedlings was carefully traced, it would be found that while a few differed in the form, size, and texture of the leaf, others in the size and quality of the fruit or habit of growth, the major part would be nearly identical with the prevailing variety on the estate. This is all right where the prevailing strain is good. But where the product for which a plant is cultivated shows signs of exhaustion, or has become deficient in quality or quantity, the strain is said to have "run down," and in all such cases too much individualism in reproduction is undesirable. It is in all probability to prevent this running down of strain or breed that Nature insists on cross-fertilisation.

Coffea arabica, or Arabian coffee, of which there are several well-defined local varieties, known by such names as "Chick," "Coorg," and "Nalknad," has been almost exclusively cultivated in this country from the time the industry was started, and it is only within recent years that one or two new varieties and species have been introduced and cultivated on the estates. This fact will explain the absence of hybrids over such an extensive area, there being no material to make hybrids from. Yet, within the past few years, some hybrids have made their appearance, shortly following the introduction of Liberian coffee, a distinctly new species. And, barring the fact that two distinct species have been placed in juxtaposition to each other, the hybrids are the work of Nature. But in the instances referred to, man must get the credit of having materially helped Nature by providing a new species for the latter to work upon.

If he would, therefore, do more in this direction, the chances are that worn-out strains of coffee would soon be replaced by better kinds.

This leads me on to the suggestion that approved varieties and new species of coffee should be freely introduced from other countries. The field for experiment would then be much widened, as planters would have sufficient material to work upon.

The cultivated forms of coffee in different parts of the world are already so far advanced of the indigenous or wild bush that it would probably be mere waste of effort to bring the latter into experiments, the object of which is to secure further improvement in productiveness and quality. Collections of species and varieties should therefore be confined, in the first instance at least, to well known jâts already in cultivation. These I shall leave the planter, being the best judge, to select for himself. Now, supposing that some enterprising planter has already secured such a collection of coffee-bearing plants, how is he to dispose of them to the best advantage?

This is a question that I shall endeavour to answer in my next.

With one or two new species of coffee at one's disposal, and a like number of distinctly marked varieties, such as the "Maragogipe," which is an introduced variety (from Brazil) of *Coffea arabica*, an experimental plot could be started on the following lines:—

(*a*) Situation, as regards aspect, soil, water and shade, to be the best the estate can afford. Occasionally irrigation will probably be required to induce the different bushes to blossom together, so that the possession of a perennial water-supply would be a convenience.

(*b*) The crossing-plot need not exceed one-eighth, or at greatest one-fourth, of an acre in extent, while it is possible that equal results may be obtained by working systematically on a few bushes.

(c) In planting up the crossing-plot, an equal number of healthy seedlings of the estate coffee should be thoroughly mixed with the new kinds, so that winged insects may have full play on the whole. But in addition to the general and haphazard operations performed by the insects, a few bushes should be carefully isolated for hand-fertilisation. For the latter purpose a few skeleton frames covered with fine muslin would be a sufficient protection, if placed over the bushes before the flowers opened. Plant in a square plot at 6 by 6 feet, so that air may circulate around the bushes freely. The preliminary details which I have emphasised under the sub-headings *a*, *b*, and *c* will keep the planter employed for at least two years, or, to be strictly accurate, until a maiden crop of flowers is produced in the crossing-plant.

Then, at this latter stage, the work of fertilisation will actually begin, should several distinct kinds of coffee flower simultaneously. Unprotected bushes will be pollinated through the agency of insects chiefly, while the protected ones will be self-pollinated, should no precautions be taken to prevent it. Where bushes are intended for hand-fertilisation, it will be necessary in the early stages of reproductive growth to rub off a great many of the young flower buds, so that the inflorescence of an individual may be reduced to a manageable number of flowers. For that matter, the flowers could be reduced to what is borne on a single primary, or to a few clusters of the same. The necessity for this apparently ruthless treatment is contained in the fact that, during the short time the stigma is receptive of foreign pollen, the fertiliser could only pollinate a limited number of flowers with any degree of certainty. It is, therefore, wiser to make sure of getting a few good crosses than to attempt a larger number indiscriminately. Let us now suppose that the operation is about to take place. Having provided himself with the necessary requisites,* and selected a protected bush to become the seed-bearer, the fertiliser places himself under the protective frame, and eagerly watches for the opening of the first flower. Directly the flower opens (usually early in the morning), there will be seen, slightly projecting from its delicate-white throat (tube of the corolla), a bifid, or two horned stigma, supported by 5 to 7 arrow-headed anthers on short stalks. At the time of opening, the stigma, which is seen well in advance of the anthers, glistens with a sticky substance which holds fast any powdery matter, such as pollen, that may fall on to it. What the fertiliser has to do at this stage is to dust a little foreign pollen on to it by means of his camel's-hair brush. This done, he instantly, and as deftly as possible, cuts away the 5 to 7 anthers behind the stigma. But as the anthers are usually closed at this early period, they could perhaps do no harm if they were left. Everything would depend on the behaviour, so to speak, of the stigma towards the new pollen by which it has been fertilised.

The process as described above has to be done with every flower until the primary or clusters of flowers reserved for crossing have been exhausted. A register is then made of the parentage on both sides, and after a day or two the bush is liberated from its protecting covering.

I have examined many coffee flowers at the moment of opening ; in most cases the stigma projects in advance of the anthers and the style lengthens rapidly. By this means the spreading horns of the stigma afford a good platform for small bees and other insects to rest upon when searching for honey. Then flitting from one stigma to another they deposit quantities of pollen, which readily adheres to their hairy limbs. Crossing operations being completed, the next step would be to select a suitable piece of land for the cultivation and trial of seedlings raised from the crossing-plot. It is in this final stage of the experiment that the exact result of cross-fertilisation would become apparent, and not before.

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* A fine camel's-hair brush; small, sharp penknife; small, sharp pair of scissors; pocket lens; flowering branch from male parent, with pollen.

But the operator needs to possess patience, for among 10,000 seedlings cultivated there may not be one showing real improvement in every respect.

With our limited experience in crossing, it is uncertain what would happen, although there is reason to believe that cross-fertilisation would induce beneficial variation in the growth and production of coffee.

The land required for testing seedlings of mixed parentage should be of the best quality, and the cultivation should be on a liberal scale also. Area is a matter for the planter himself to decide, as it depends wholly on the extent of his operations. I do not, however, advocate large areas for mere experimental work. When the seedlings give their maiden crop, it will be seen approximately what merits they possess from a productive point of view. But other merits, which may be roughly termed constitutional, will only become apparent after a lapse of time and under different modes of treatment.

I can readily imagine that a judicious selection of the fittest would prove a most difficult task, even to an expert.

The operations discussed from the beginning until now, when the second generation has borne its first crop of fruit, cover a period of about six years. This is a long time, and some men would doubtless say "is the trouble worth the candle? especially as there is nothing to prove that much good would come out of it." In answer to such a remark, I am pretty firmly convinced that good would come out of it, and have already planted up a small crossing-plot with the view of raising hybrids. The plot consists "of 130 bushes, and includes *C. arabica*, *C. liberica*, and the variety—Maragogipe." A few of the bushes are already well advanced in growth, so that the first batch of crossed seedlings may fruit within five years from date. But when matured bushes can be cross-fertilised this season, the results might be known within four years, which is not very long for a young planter to wait. My object, so far, has been to explain the *modus operandi* of fertilisation rather than to discuss side-issues bearing on its application to the genus *Coffeæ*. But now, I may refer briefly to argumentative views on the latter question. As the coffee bush possesses a hermaphrodite flower, it may be held by some that crossing is neither possible nor desirable. But it does not follow that a flower is self-pollinated because it contains both sexes. In numerous hermaphrodite flowers the sexes attain maturity at different periods, and in all such cases self-pollination is effectually prevented. That dichogamy prevails to some extent in the coffee-flower is certain, as I have often observed stigmas in the receptive stage when the anthers had not dehisced. I am unable to say, however, if this is a general condition, or if it only happens in occasional flowers. A flower may thus be structurally hermaphrodite and functionally unisexual. Then, the sweet-scented coffee-flower offers great attraction to insects, which is a pretty sure sign that the dispersion of pollen is favoured by Nature. Indeed, the condition of the pollen is such as would adhere readily to the hairy limbs of insects. It is not of the fine powdery kind (so-called dust of flowers) that would be suspended in the air or lightly carried by the wind.

Considered, therefore, from a morphological standpoint there is little doubt but the genus *Coffeæ* is subject to cross-fertilisation, and that its flowers are entomophilous. Lastly, I wish to dispel the idea that established coffee can be influenced one way or the other by operations of crossing, the results of which are only discovered in a subsequent generation.

But it is highly necessary that the planter should strictly conserve his testing-ground, and not allow any unknown seed to be utilised for estate purposes. The golden rule in the testing or experimental ground is to destroy all inferior forms as quickly as possible.

New strains of seeds reserved for trial could be treated separately until such time as their merits are fully established. This is all I have to say on the fertilisation of the coffee flower at present.—Extract from *Planting Opinion*.

MALE COFFEE PLANTS.

A VERY interesting discussion is going on amongst Indian coffee-planters on the subject of male coffee plants. Some writers assert that there is no such thing, that the coffee plant is not *diœcious*. In answer to a letter on the subject by Mr. G. R. Oliver in the Indian Press, the South Sylhet correspondent of an Indian paper is quoted as follows by *Planting Opinion* :—" I noted Mr. G. R. Oliver's letter on male coffee plants, as also the extract from *Planting Opinion* in recent issues of the *I. P. G.* The subject is, as stated in the article, a most fascinating one, and will well repay study. It is rather extraordinary that any one living during the latter years of the last decade of the nineteenth century should have a lingering doubt of what was well known to the Arabians from time immemorial. The sexual system of Linnæus is founded on the soundest principles, and our own Dr. Roxburgh never found a single plant in India which did not corroborate this fact. Space will not allow my going further into the subject now, but I will return to it in a future letter. However, I may say that the coffee plant is not *diœcious*; and the fact of the bush, to which Mr. Oliver alluded, having an abnormal number of peaberries on it is no sign of it being a male plant. If there ever will be such a thing as a male coffee bush,* it will have no seed. The very fact of a bush producing seed, and, moreover, that seed germinating, is ample evidence of its not being an absolute male. It would be interesting to know if the seedlings of the coffee bush inherited the peculiarity of the parent plant by also giving peaberries. The cause of peaberry is not definitely know, although reasons have been surmised. A grade of coffee goes under the name of peaberry on the market, and brings a somewhat higher price than the ordinary, but I think that the name is only given to a grade which has a large proportion of peaberry. Perhaps some other of your correspondents can give a full explanation."

Mr. F. M. Bailey, Government Botanist in Queensland, says that no such a thing as a male coffee plant has ever come under his notice, nor has it, to his knowledge, been mentioned by any other botanist. The coffee plant is neither *diœcious* nor *monœcious*; but is *hermaphrodite*, the flowers containing both male and female organs. As to a tree which bears peaberry being considered a male, the idea is absurd. If the tree were male it would not bear at all any more than would a male date tree. It is possible for the flowers to lose the female organs, and for the tree thus to be barren; but still this could not be considered a male tree unless such a condition were ever afterwards its characteristic.—Ed. *Q.A.J.*

RHEA *(BŒHMERIA NIVEA).*

RAMIE OR CHINA GRASS.

By W. SOUTTER.

A GREAT deal has been written upon the subject of Rhea (*Bœhmeria nivea*), also known as China grass. As far back as 1869 the Indian Government offered a reward of £5,000 to anyone who could successfully separate the refractory fibres from the bark. Numerous methods, both mechanical and chemical, were tried, but without avail until quite within recent date. To Mr. Gomess, an English chemist, is due the discovery of perfecting the system of separating the resins from the fibre. The "Gomess" process has been proved to be a perfect success, and the cost of the operations is not prohibitive.

The "Rhea" is not by any means a new plant, nor is the knowledge of its use as a fibre of recent origin, although it only became known to Europeans about the beginning of the present century.

India, China, and Egypt, on the other hand, have known its value as a textile plant since the daybreak of history, and fragments of Rhea cloth have

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* In course of time there very likely will be.

Plate CV.

CLUMP OF RHEA *(Bœhmeria nivea)*, also called CHINA GRASS.

Plate CVI.

RHEA *(Bœhmeria nivea)*, commonly called CHINA GRASS.

a, Female flower ; *d*, cluster of female flowers ; *b*, male flower ; *c*, seeds, natural size ; *e*, seed magnified.

at various times been unearthed in burial places. In Assam. and on the Nile, where it was used for enveloping mummies, many pieces of Rhea cloth found on the mummies are in good state of preservation.

The Gomess process for separating the fibres and eliminating the resins present in the plant is at once simple and effective, and does not in any way affect the strength or lustre of the fibre. In a pamphlet published by the Rhea Fibre Treatment Company, Limited, London, they give the process as follows:—

"After the 'ribbons,' or strips of bark, have been freed from dirt, they are placed in weak acid baths for the night. Next morning they are passed through a mild alkaline bath, and are then boiled in weak solutions of caustic soda to which lime has been added.

"When washed and dried by the usual mechanical means, the fibres emerge in a long silky *filasse*, entirely free from the cuticle and resinous gums in which they are embedded—clean, white, and ready for the comb of the spinner."

Regarding the strength and weight of the Rhea thread, as compared with linen thread, the breaking strain is much greater, whilst 1,000 yards of Rhea canvas weigh 400 lb. less than the same quantity of linen.

As regards the soil and cultivation suitable for Rhea, both are of the simplest description. The plant will thrive in almost any description of soil except in absolute swamps, as the plant is rather impatient of moisture.

It thrives in strong alkali soils, except such as abound in carbonate of soda, but in all situations it will be immensely improved by a heavy mulch while the plants are yet young. After the first cutting, the leaves that are stripped from the stems should on no account be taken off the ground, but should be either ploughed or hoed into the soil. The plants should be grown in rows from 4 to 6 feet apart and from 2 to 4 feet from plant to plant. The surface between the rows should be occasionally stirred either by horse or hand hoes or by cultivators.

Propagation.—This is carried on by means of seedlings, cuttings, or by root divisions, the latter method being the most expeditious where there are plenty of old ratoons to work from. It is best to plant out on slight hills which can be raised by the plough. A mulch of straw or other material should then be put on, and after the plants are well above ground, a second furrow should be thrown up on to the mulch. The plant is sometimes propagated by seed, but this process is both tedious and at all times somewhat precarious. Root cuttings can be transmitted for long distances if properly packed; therefore the plant can readily be distributed.

As regards the time of harvesting, we have the authority of Mr. James Montgomery, who has had considerable experience in the cultivation of this plant in India. In his report to the Government of India, he says:—"My own experience indicates that the stems should be gathered so soon as the cuticle shows a clear brown colour for about one-third of the length. At this stage, if the plant be healthy, the stems will be clear from base to summit, and the branch buds in the axil of each leaf-stalk just showing."

It is somewhat difficult to estimate the exact yield per acre. It has been put down at various amounts ranging from 1,400 lb. of dried thongs or ribbons, to 2,800 lb., but in well-established plantations this would be nearly doubled.

After cutting the stems, they should be immediately peeled either by hand or by the aid of mechanical decorticators, the latter being the cheaper in the end. The ribbons are then dried thoroughly, packed in bales, and sent to the market; but on no account bale ribbons while any moisture remains, otherwise the strength and lustre of the fibre will be impaired.

A London syndicate recently report that they are in the demand market for Rhea. They state:—

(*a*.) That they require the raw material in the shape of ribbons—that is, the bark stripped from the stem, and thoroughly dried and packed in bales;

(*b*.) That they prefer the species *Bœhmeria nivea;* but that they are also buyers of *Bœhmeria tenacissima* and Ban-Rhea.

(*c*) That the quantities required by the syndicate would be continuous and very large; that it would be difficult to give exact figures, but that they could do with 10,000 tons to commence with.

(*d*) That they are at present prepared to contract at prices equivalent to from £10 to £11 per ton delivered in London, or at £7 a ton f.o.b. in India.

It has been conclusively proved that the Rhea (*Bœhmeria nivea*) can be grown in Queensland most successfully. Many thousands of plants have been sent to various parts of the colony, both by the Department of Agriculture and the Acclimatisation Society. It only remains for enterprising settlers to undertake the cultivation of the Rhea to thus establish another national industry.

The Rhea plant rapidly exhausts the soil, as may be seen by the following analysis:—

Ten tons of dried stems, which, under favourable conditions, is the product of 1 acre, contain by analysis 251·98 lb. of potash, 155·70 lb. of phosphoric acid, and 369·70 lb. of nitrogen.

Now although, as has been stated here, the Rhea plant will grow on any soil except swamp, it is quite clear that the constituents taken from the soil by the plant must be replaced if we wish to keep up a continuance of heavy crops. Hence, we must resort to artificial fertilising when natural manures are scarce. These fertilisers are potash, phosphates, and nitrates. These fertilisers are not expensive in proportion to the resulting crops. We gave the prices of nitrate of soda, superphosphate, and kainit in the February number of this *Journal*. Unfortunately by a clerical error the prices were quoted at per sack instead of at per cwt.

They are obtainable in Brisbane at the following prices:—

	s.	d.	
Nitrate of soda	12	6	per cwt.
Superphosphate	4	6	,, ,,
Kainit (potash)	4	0	,, ,,

For results of the application of these fertilisers, we would ask our readers to study the various articles which we have lately published on the manuring of tropical plants, notably those relating to the manuring of corn (maize), which requires much larger quantities of plant-food ingredients than other cereals, removing, as it does, large quantities of potash and nitrogen from the soil, as in the case of Rhea.

Forestry.

SOME TIMBER TREES OF QUEENSLAND.

By J. W. FAWCETT,
Member of the English Arboricultural Society.

THE SWAMP OAK (*CASUARINA GLAUCA*, Sieber).

BOTANICAL DESCRIPTION.—The Swamp Oak is generally a moderately sized tree growing to a height of from 30 to 50 feet, with a diameter of from 9 to 12 or 15 inches, but in favourable localities it becomes a robust tree attaining a height of from 70 to 90 feet, with a diameter of from 2 to 3 feet. It has leafless robust branches.

Plate CVII.

CASUARINA GLAUCA (SWAMP OAK)—Diameter, 3 feet.

Bark.—The bark is rough, and of a hoary-grey colour.

Leaves.—The leaves of the *Casuarinas* are replaced by small whorled scales. In this species, the branchlets are usually pendulous and generally from 10 to 12 in a whorl, but the parts vary from 9 to 16.

Flowers.—The flowers are diœcious (*i.e.*, the male flowers and the female flowers are borne on distinct plants). The male spikes are dense, and about an inch in length.

Fruit.—The fruit is a cone usually sub-globose (*i.e.*, not quite spherical), flat-topped, and about half-an-inch in diameter.

Vernacular and Botanical Names.—The Swamp Oak (so called from its general habitat), is also known as the River Oak or River She-Oak (also named from its habitats), Beefwood (from the likeness in colour of the timber to beef), Bull-Oak (on account of its robust appearance); Ironwood (from the hardness of its timber). The name "Cassowary" tree has been applied to it from the likeness of the branchlets to the feathers of that bird. It is also known by the aborigine names (in New South Wales) of Belah or Belar, or Billa. The name "oak" was given (like many other names given to Australian trees, &c., by the earliest settlers, from some resemblance or likeness to those in England), because the timber when worked up had some resemblance to that of the English Oak. The generic name, *Casuarina*, was given by Linnæus to the genus on account of the pendant branchlets resembling the feathers of the cassowary. The specific name, *glauca*, was given to this species by Mr. F. W. Sieber, a collector of Australian plants, on account of the hoary-grey colour of the tree.

Distribution.—The Swamp Oak is widely distributed throughout Australia, and especially Queensland, New South Wales, Victoria, and South Australia, preferring generally the margins of rivers and swamps, and marshy localities in open forest lands, but is nowhere found in forest-like patches.

Uses.—The timber of the Swamp Oak is of a reddish colour, beautifully marked and very close-grained. It is also hard and durable, strong and tough, and is valuable, and much used for shingles and staves. It is also useful as a cabinet wood. The straight saplings make splendid rafters for bush buildings, and old trees, with plenty of heartwood, make good posts, lasting well in the ground. All the *Casuarinas* are splendid trees for planting. They are all of very rapid growth, and make good breakwinds, copses, or shelter plantations. The saplings are always useful for many other things besides the speedy supply of excellent firewood which they give. These trees form one of the most striking features of the Australian landscape. Their leafless branches and black, gloomy, sombre appearance always make a sad impression on the traveller, and whenever there is a slight breeze there comes from them a dull, depressing sigh. They are remarkable as belonging to a class of trees which abounded in the forests of other countries in long-past geological ages, as is evidenced by the fossil remains frequently found in the coal measures.

The Swamp Oak, besides being a quick grower, is a very beautiful tree if planted apart, its tall, straight-stemmed trunk and pendulous leafless branches showing well.

THE HORSE-TAIL OAK (*CASUARINA EQUISETIFOLIA*, Forst.).

Botanical Description.—The Horse-tail Oak is a lofty tree of moderately large size, attaining a height of from 50 to as much as 150 feet, with a diameter varying from 12 to 30 inches.

Bark.—The bark is rough.

Branches.—The branches, which give it a very peculiar appearance, are long, slender, and wiry; the principal ones are spreading or ascending, the smaller ones generally pendulous or drooping. They are of a greyish-green colour, glabrous or tomentose when young, with very small scale-like sheaths instead of leaves.

Leaves.—The leaves are sheath-teeth, arranged in whorls, from 6 to 8, usually 7, in number, and are very short and acute.

Flowers.—The flowers are diœcious—that is, they have neither calyx nor corolla, the stamens with the pistils being on separate flowers. The male flowers have only one stamen, and are in spikes about three-quarters of an inch in length, and terminate in a slender deciduous branchlet. The female flowers possess a one-celled ovary, and are arranged in dense heads.

Fruit.—The fruit consists of hardened bracts, collected in a strobilus, or compact cone, about half-an-inch in diameter, of a globular shape, each enclosing a small shining or velvety winged nut.

VERNACULAR AND BOTANICAL NAMES.—The Horsetail Oak (so called from the likeness of its long pendulous branchlets to the long hairs of a horse's tail) is also called Forest Oak (from growing in small patches or forests); Coast Oak (from its growing generally on the coast); Swamp Oak (from its growing in swampy localities); Bull Oak (from its robust growth); and Ironwood (from the hardness of its timber). It is called Aitoa or Toa in the Society Islands, Filao in Madagascar, and Noko-noko in the Fiji Islands. The specific name, *equisetifolia*, was given to this species by the Forster brothers, writers on Australian botany, from the resemblance of the branches to an *Equisetum* or Horsetail.

DISTRIBUTION.—The Horsetail Oak loves a maritime situation, growing freely in sandy saline soils. It is found growing in great abundance near salt-water marshes and inlets on the coasts of tropical Queensland, North Australia, New Guinea, the Malayan Archipelago, the Indian Archipelago, on the eastern side of the Bay of Bengal as far north as Aracan, Eastern Africa, Madagascar, the South Sea Islands (Fiji, Society Islands, &c.), &c.

USES.—The Horsetail Oak produces a dark-coloured timber, coarse but closely grained, beautifully marked, hard, light, and tough. It is useful for shingles, staves, and veneers, and for all purposes where lightness and toughness are required. Its timber makes splendid fuel, giving great heat and leaving very few ashes.

In the Society Islands, where it grows chiefly on the sides of the hills, its timber was formerly used for making clubs and other implements of war. Its hardness and durability led the earlier voyagers to the South Seas to distinguish it as Ironwood, although it is a very different tree from that bearing the same name in North America. (This latter is botanically known as *Carpinus americana*, Mich.) Its dark hairlike pensile foliage gives it a mournful appearance, and in many of the islands of the Pacific it is consecrated to the dead, and, with crimson *Dracænas* and other shrubs and trees, is planted in or near burial-grounds. This tree has long been cultivated in gardens and nurseries, and has been introduced into France and India and other countries. It bears transplanting well, and will grow in sandy soil even to the edge of the sea. Captain Campbell Walker estimates the yield of firewood from this tree to be four times as great as the return from any tree of the forests of France. In India, where it grows on pure sand, it is greatly valued, as its timber bears a great strain, and is not readily injured by submersion in water, and it is also much used as fuel for railway locomotives. The cost of rearing *Casuarinas* in India has averaged, according to localities, from £4 to £10 per acre, and the return, after only eight years, averaged from £13 to £32. I would recommend this tree as a valuable one to plant on the coastal portions of our barren "wallum" patches.

The branchlets of this, as of other *Casuarinas*, have a sub-acid flavour, and are readily eaten and relished by cattle, especially during the droughty seasons in Queensland, and in many parts it is pollarded for fodder.

A variety of *Casuarina equisetifolia*, Forst., named *incana*, having horny or woolly young shoots and large cones nearly an inch in diameter, is found on the islands off the Queensland coast and also in New South Wales.

Plate CVIII.

CASUARINA SUBEROSA (FOREST OAK).

THE ERECT SHE-OAK (*CASUARINA SUBEROSA*, Ott. et Dietr).

Botanical Description.—The Erect She-Oak is a moderate-sized, often tall tree, growing to a height of from 30 to 50 feet, with a diameter of from 12 to 18 and as much as 24 inches. It is a fine tree with an erect trunk.

Bark.—The bark is rough and not corky, as is generally supposed from its specific name.

Branches.—The branches are leafless, the principal ones being elongated and spreading or ascending; the smaller ones generally pendulous or drooping, usually slender and quite glabrous.

Leaves.—The leaves are represented by sheath-teeth in whorls from 6 to 8, generally 7, in number.

Flowers.—The flowers are often monœcious (*i.e.*, both stamens and pistils (male and female flowers) are found on the same plant). The male spikes are long, slender, and interrupted, several inches in length, of a reddish colour, and much darker than in most other species.

Fruit.—The fruit cones are ovoid or oblong in shape, often flat at each end, and over an inch in length.

Vernacular and Botanical Names.—The Erect She-Oak (so called from its erect trunk) is also called the Black Oak (from its dark-coloured timber), Forest Oak (from its growing in little patches or forests), Swamp Oak (from one of its habitata), Shingle Oak (from being much used for shingles), River Oak (from one of its habitata), and Victorian Beefwood (from its being the most common of the Beefwoods in that colony). The specific name, *suberosa*, signifies corky, or of the nature of, or having some appearance to, cork, and was given to this tree by the German Botanists, F. Otto and A. Dietrich, and also by the Dutch Botanist, F. A. Miquel. It is, however, misapplied to this tree, for it is by no means of a corky nature.

Distribution.—The Erect She-Oak is found generally in open country, very often in patches almost entirely confined to itself, in the coastal districts, both North and South Queensland, New South Wales, Victoria, and Tasmania.

Uses.—The timber of the Erect She-Oak is of a dark-brown, very prettily marked, coarse in the grain, but hard and tough. It is a handsome timber, strong and durable, and is very valuable. It is used for bullock-yokes and hurdles, shingles, staves for buckets, kegs and tubs, mauls, &c. It is also useful in cabinet-work and for veneers.

The Erect She-Oak is a beautiful shady tree, and one well worthy of planting for ornament or shade.

THE SCRUB SHE-OAK (*CASUARINA CUNNINGHAMIANA*, Miq.).

Botanical Description.—The Scrub She-Oak is a small tree growing to a height of from 20 to 40 feet, with a diameter of from 6 to 12 inches. In some localities it grows very tall and slim. It is a very handsome tree.

Bark.—The bark is rough.

Branches.—The branches are slender and leafless, and resemble very much those of the Horsetail Oak (*C. equisetifolia*, Forst.).

Leaves.—The leaves are sheath-teeth in whorls of from 6 to 8, generally 7, and resemble the Erect She-Oak (*C. suberosa*, Ott. et. Diet.).

Fruit.—The fruit cones are very small, being under half-an-inch in diameter, and nearly globular in shape.

Vernacular and Botanical Names.—The Scrub She-Oak (so-called from growing in scrubs) is also Cunningham's She-Oak (after the botanist of that name). It is often simply called Scrub Oak, and is also oftentimes called by the aborigine name of Belar, which, however, rightly belongs to *C. glauca*, Sieb. The specific name, *Cunninghamiana*, was given to it by the Dutch Botanist, Miquel, after Allan Cunningham, the Australian Botanist.

DISTRIBUTION.—The Scrub She-Oak is found growing both in open forest lands and in scrubs, often on river sides, in both the coastal and inland districts of Queensland and New South Wales.

USES.—The Scrub She-Oak yields a dark-coloured timber, closely grained and prettily marked. It is light, but hard, strong, and tough, and is useful for shingles and staves.

The Scrub She-Oak does well in planting. It is a quick grower, and has beautiful foliage. For beauty and ornamentation it is worthy of more attention than what it has up to the present received.

THE THREADY-BARKED OAK (*CASUARINA INOPHLOIA*, F. v. M. et Bail).

BOTANICAL DESCRIPTION.—The Thready-barked Oak is a small sized scrubby tree growing to a height of from 25 to 40 feet, with a diameter varying from 6 to 10 inches.

Bark.—The bark is curious looking for this genus, and is composed of long, flat, narrow, somewhat fibrous, or threadlike particles or scales.

Branches.—The branches are slender.

Leaves.—The rudimentary leaves in sheath-teethed whorls of from 7 to 9, and very acute.

Flowers.—The male spikes are long and slender, and of a purplish or reddish colour.

Fruit.—The fruit cone is of an irregular shape and about an inch in diameter.

VERNACULAR AND BOTANIC NAME.—The Thready-barked Oak is also called the Stringy-barked Forest Oak, both names being given to it from its fibrous or thready bark. The specific name, *inophloia*, was given to it by both Baron Mueller, the late Victorian Botanist, and Mr. F. M. Bailey, our own Botanist, in reference to the same subject.

DISTRIBUTION.—The Thready-barked Oak is found on poor sandy flats or ridges in the inland districts of South Queensland on both sides of the coastal range.

USES.—The timber of the Thready-barked Oak is of a reddish colour, and very beautiful. It is nicely marked with numerous dark streaks, hard and closely grained, and ought to prove suitable for cabinet-work. At present it is not much used.

THE FOREST OAK (*CASUARINA TORULOSA*, Ait.).

BOTANICAL DESCRIPTION.—The Forest Oak is a tree of variable size, growing to a height of from 30 to 40 to as much as 70 and 80 feet in suitable localities, with a diameter averaging from 9 to 18 and 24 inches.

Bark.—The bark is usually very corky.

Branches.—The branches are leafless and drooping, with very slender branchlets.

Leaves.—The whorls of rudimentary leaves are in numbers of generally 4 or 5, the sheath teeth being very short.

Flowers.—The flowers are diœcious, or sometimes monœcious; the male spikes are very slender, about an inch in length, terminating in deciduous branchlets.

Fruit.—The fruit cones are oblong, or nearly globular, but flat-topped, about three-quarters of an inch in diameter, and velvety in appearance.

VERNACULAR AND BOTANICAL NAMES.—The Forest Oak (so called from being generally found in open forests) is also known as Beefwood (from the resemblance of its timber to beef), River Oak (from in some districts preferring river banks), and Cassowary Tree (from its pendant branchlets resembling the

Plate CIX.

CASUARINA TORULOSA (FOREST OAK).

cassowary's feathers). The specific name, *torulosa*, signifying slightly uneven, was given to this species by W. T. Aiton, of the Royal Botanic Gardens, Kew, in reference to the ribs of the branchlets being scarcely prominent.

Distribution.—The Forest Oak is found in open forest lands in Queensland, New South Wales, and South Australia, often occupying large tracts of land. It is also fairly common on high lands and many of the ranges.

Uses.—The timber of the Forest Oak is of a reddish colour, and very nicely marked. It is a handsome wood, sometimes remarkably heavy, and of great strength, hard, tough, and close in the grain. It is in much demand for durable shingles and furniture-work, and is also much used for yokes for bullock drays and wagons, and for staves. It is also valuable for cabinet-work, and gives a handsome veneer. It furnishes one of the best timbers for fuel, and is thus greatly in favour both for domestic use and for heating bakers' ovens. It burns with a clear white ash, and leaves no cinders.

It is a tree which is worthy of cultivation, for when growing on good soils it makes a handsome tree.

ON CASUARINAS GENERALLY.

All the *Casuarinas* ought to be planted more frequently than they are. They are all fast-growing trees, growing as much as 3 and 4 feet in one year in height, and are all useful. There is no waste, for the timber of all species makes excellent firewood. Besides this, they make excellent breakwinds or shelter plantations. For general beauty and use (in so many ways) they are hard to beat, and farmers and settlers might do worse than plant some of them.

FOREST CONSERVANCY IN VICTORIA.

"Bruni," in the *Australasian*, recently speaks very highly of the work which is going on in many parts of the colony in replanting the forests which have been so mercilessly destroyed. He says:—"On the southern edge of the great western plain of Victoria, about 15 miles to the northward of Camperdown, and just outside the northern boundary of the old forest that marked the line of coast rain, there is a group of half-a-dozen estates on which extensive shelter plantations have been formed. The area of land afforested on these properties is probably not far short of 10,000 acres, and, so far from there being any loss of pasture in consequence, I have been assured by the proprietors that the grass is much improved. The stock are much benefited by the shelter, and the sheep are assured of a good, dry camping-ground in any weather. It has been found that since the plantations grew up the country carries more stock, and carries them far better than it did before. Driving along the excellent road from Terang to Darlington, the traveller, as he passes the boundary line of the old forest, sees in every direction before him great masses and lines of foliage, that loom black against the tawny hue of the withered pasture. These plantations are not limited to one spot, for they stretch out for 20 miles into the plain."

A NEW INDUSTRY.

A NEW USE FOR HARDWOOD.

Whilst our supplies of soft woods are rapidly disappearing from the scrubs, there is still a large amount of various descriptions of hardwoods to be found in them, all of them of commercial value in the future if not at present. The following are some of the best of the scrub hardwoods:—

Penda (*Xanthostemon oppositifolium*).
Yellow-wood (*Flindersia Oxleyana*).
Crow's Ash (*Flindersia australis*).

Hickory (*Flindersia Iffilaiana*).
Swamp Mahogany (*Tristania suaveolens*).
Scrub Box (*Tristania conferta*).
Turpentine (*Syncarpia laurifolia*).
Scrub Bloodwood (*Balloghia lucida*).
Tulip-wood (*Harpullia australis*).
Teak (*Dissiliaria balloghioides*).
Johnstone River Hardwood (*Eugenia Bancroftii*).
Scrub Ironwood (*Myrtus Hillii*).
Lignum vitæ (*Vitex lignum vitæ*).

All of these are being yearly felled and burnt off in the interests of agriculture; but a day will surely come when they can be put to some profitable use. Perhaps the following note from the Toronto *Globe* (Canada) may attract the notice of some enterprising saw-mill proprietors. At all events, the idea there set forth is well worthy of notice:—

As the pine-tree was "passing," no industry turned up of great magnitude to create a value for the standing hardwoods remaining on the stump (says the Toronto *Globe*). The pine vanishing left a weird-looking crop of hardwoods untouched by the lumberman's axe, and despoiled of much of its commercial worth by King Coal. It also too often fell a prey to the destructive bush fire. A new industry is being opened up to bring it into prominence and value. It has been found that the wood, especially beech, birch, and maple, cut into thin veneers, and cemented together three-ply, the thickness of the whole about $\frac{5}{16}$ inch, make very superior packing cases for carrying all kinds of heavy and light merchandise. To show that this is a very large field, it is stated that about 40 per cent. of the pine now cut finds its way into packing cases. This veneer box is waterproof for all practical purposes, it is less bulky, more durable, and much lighter than the 1-inch pine packing case now in use. By this reduction of weight, the saving in freight and express charges over long distances, it is claimed, will give the shipper his packing case free of cost, which is a consideration in the expense account not to be overlooked. A veneer factory solely for this purpose, worked by an English company, has already made its appearance in Toronto. Another mill, by a different English company, is being built in the easterly section of New Brunswick, where hardwoods abound close to the seaboard, from where shipments to England, the great user of packing cases, can be economically made by water the year round. Here the veneer is manufactured, cut into sizes, and shipped to the London factory, where the cases are put together and distributed.

Entomology.

QUEENSLAND CATTLE TICKS.

WE have received from Mr. P. R. Gordon, Chief Inspector of Stock, the following highly interesting report by Mr. Claude Fuller, F.E.S., Assistant Government Entomologist, Cape Town, on ticks which were fowarded to him from Queensland by Mr. Gordon and Mr. Pound, Director of the Queensland Stock Institute. In his accompanying letter to the former, Mr. Fuller says:—

NOTES ON THE QUEENSLAND CATTLE TICK, AND ITS RELATIONSHIP TO THE TEXAS FEVER TICK AND THE BLUE TICK OF CAPE COLONY (SOUTH AFRICA).

By CLAUDE FULLER, F.E.S.,
Assistant Government Entomologist to the Department of Agriculture, Cape Colony.

The second lot of ticks which you and Mr. Pound have been so good as to send me arrived, *viâ* London, safely last week. Altogether they are a very interesting and useful lot. The sheep "ticks" I am very glad to get hold of, not having any in my collection; the same applies to the fowl ticks, specimens of which I have long desired in order to compare them carefully with our local pest. The exact scientific name of this tick is as yet unsettled, but I think it will yet prove to be *Argas reflexus*, and that *Argas miniatus*, *A. persicus*, and *A. americanus* are only synonyms, being all one and the same thing. So far, I have been unable to find any difference between specimens from America, Australia, India, and Cape Colony.

The two large ticks sent are members of the genus *Amblyomma*, but I have not been able to make out the species as yet for want of time. You will see that they are not unlike our local *Amblyomma*, of which I am sending some specimens, but these will not reach you for some time after this letter.

Together with this, I am sending you some notes on the various cattle ticks, from which you will see that I have found the North American, the Australian, and that from Cape Colony distinct from one another. The Queensland form appears to be a new species, for which I have proposed the name *australis;* it is curious that it is the same as the one Mr. Pound sent me as coming from South America.

These notes I have written in a form suitable for reproduction in your *Agricultural Journal*, in the pages of which I should like to see them reproduced. Drawings suitable for making zinc blocks from are also sent, which if added as illustrations, will render the notes much more valuable.

As early as 1893 the Queensland cattle tick was identified as *Ixodes bovis*, Riley, by the late A. S. Olliff, and was until recently regarded as specifically identical with that species by many later students. I believe that the first doubt as to the correctness of this assumption was thrown out by Dr. D. E. Salmon, Chief of the U.S.A. Bureau of Animal Industry, in a letter to Mr. P. R. Gordon, Chief Inspector of Stock (Queensland). In this communication (dated 9th December, 1897) Dr. Salmon says: "You will possibly recall that we considered the Australian form distinct from our American form. Professor Neumann—who had for his monograph a very large number of specimens, including our entire collection, and has studied the Australian ticks which Dr. Hunt gave us some time ago—does not, however, agree with us on this point, but considers that they are identical."

As it has since become important to settle the identity of the supposed redwater tick in Cape Colony, also said to be *I. bovis*, I have made a careful study of all three forms, and have come to the conclusion that they are three distinct species.

The specimens of *Rhipicephalus annulatus*, Say. (*Ixodes* (*Boophilus*) *bovis*), were kindly furnished, through Mr. C. P. Lounsbury, by Dr. L. O. Howard, Entomologist, U.S.A., Dr. M. Francis, of Texas, and Professor H. A. Morgan, of Baton Rouge, Louisiana. The Australian form and a few from South America, which prove to be identical with it, were very kindly sent to me by my friends, Messrs. P. R. Gordon, Chief Inspector of Stock, and C. J. Pound, Director of the Stock Institute, Queensland.

The local Blue Tick, of which I have specimens from eastern and western parts of the colony, I regard as *Rhipicephalus decoloratus*, an insufficiently described species of Koch's. Koch's description of this species is so meagre that it is impossible to gather more from it than that he had a single specimen

from the Cape of Good Hope, which was, judging from the colour, an unimpregnated and undersized female. He figures the shield with two furrows dividing it into three regions, the median yellow, the laterals red; and it is this feature, also noticed by Neumann, who had the opportunity of studying the original type, which has chiefly guided me in determining the species as *decoloratus*, there being no other species recorded from South Africa, or known to me, which possesses the same coloration of the dorsal shield.

The Australian species, also sent as from South America, is quite distinct from either the North American or the South African, and is therefore looked upon as a new species, for which the name *australis*, by which it is subsequently referred to, is proposed.*

The genus *Rhipicephalus*, to which the above species belong, has been reviewed by Professor Neumann, in an excellent treatise entitled a "Revision de la Famille des Ixodes"†—a work that has been of the greatest assistance in making these comparisons, so that it is with much regret that I find I am at variance on one or two points with this most learned savant.

The genus, as may be gathered from the revision just quoted, contains some sixteen recognisable species which may be readily divided into two well-defined groups by referring to the number of furrows in the dorsal shield of the adult female; there being two in some species and four in others. The ticks under discussion belong to the former group, which appears to contain six species—viz., *annulatus* and Neumann's variety, *caudatus* (which I am prepared to regard as a distinct species), *evertsi*, *pulchellus*, *decoloratus*, and the Australian-South American form, *australis*. Of these, only *annulatus*, *decoloratus*, and *australis* have been studied directly, the characters of the rest being those given by Neumann, which are excellent descriptions, my North American specimens fully according with that of *annulatus*, except as regards the smaller process of the mandibles. This minute but important feature, Neumann describes as being in the form of a simple cone; with this I do not agree, as, in the specimens I have examined, it is distinctly bi-cuspid, the additional tooth being often difficult to detect, as it is implanted at right angles to the more prominent one. The species is also credited with a very large geographical distribution, which includes parts of America and the West Indies, Australia, Asia, Sumatra, and Africa. I, however, have failed to find it amongst such ticks as I have from South America, Australia, and Cape Colony.

The chief characters which I have found of use in distinguishing the various species studied are—(1) the furrows of the dorsal shield of the female; (2) the number of rows of teeth to the labium or hypostome; (3) the form of the mandibles, particularly the lesser process (the internal apophysis of Neumann); (4) the extent of the dorsal shield of the male; and (5) the presence or absence of a "tail" to the male.

The following tables indicate the bearing of these features upon the species:—

1. A. Furrows of the dorsal shield of the female extending to the posterior lateral margins:—*R. annulatus*, *caudatus*, *evertsi*, *decoloratus*, and *australis*.
   B. Furrows becoming obsolete in the middle of the shield at about half its length:—*R. pulchellus*.

(This feature removes *pulchellus* from all the others.)

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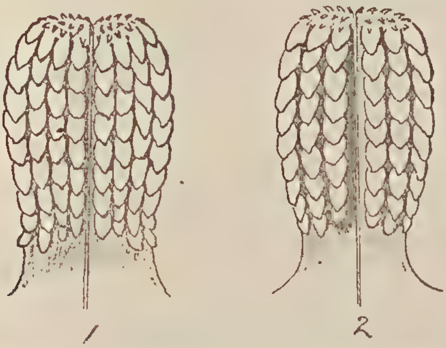
* Mr. H. Tryon, Entomologist to the Queensland Department of Agriculture, had already, in an official report on the subject of the identity of this tick on 1st February, 1899, pronounced on the distinctness of the Queensland Cattle Tick from *Ixodes bovis*. This officer, in the report alluded to, stated as follows:—"These ticks are undoubtedly examples of *Ixodes bovis*, or rather of the Queensland variety of it, regarding which it may be stated that this differs slightly, as would appear from the typical form."—Ed. *Q.A.J.*

† Memoires de la Société Zoologique de France, vol. ix., page 1, 1896, and vol. x., page 324, 1897.

2\. A. Labium or hypostome with 10 rows of teeth :—*R. caudatus* (Neumn.)
B. Labium or hypostome with 8 rows of teeth :—*R. annulatus* and *australis.*
C. Labium or hypostome with 6 rows of teeth :—*R. evertsi* and *decoloratus.*

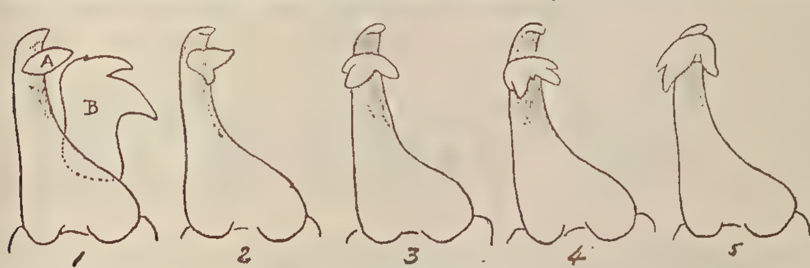
(This feature separates *caudatus* from the four remaining species, and helps to separate *annulatus* and *australis* from *evertsi* and *decoloratus.*)



1\. Diagram of the labium of *R. annulatus* and *R. australis.* 2. The same of *R. decoloratus* and *R. evertsi* (original).

3\. A. Mandibles with lesser process, bi-cuspid :—*R. annulatus.*
B. Mandibles with lesser process, tri-cuspid (Neum.):—*R. evertsi.*
C. Mandibles with lesser process, bi-cuspid, and presenting a rounded projection as well :—*R. decoloratus.*
D. Mandibles with the lesser process, tri-cuspid, and presenting a rounded projection as well :—*R. australis.*

(This feature differs in each species; there is a slight similarity between *annulatus* and *decoloratus* and *evertsi* and *australis.*)



Diagrams of Mandibles.—1. Of *R. annulatus*, A the lesser and B the greater process. 2. Of *R. annulatus*, showing that the lesser process is bi-cuspid. 3. *R. decoloratus.* 4. Of *R. australis.* 5. Of *R. evertsi.* (1 and 5 after Neumann; 2, 3, and 4 original.)

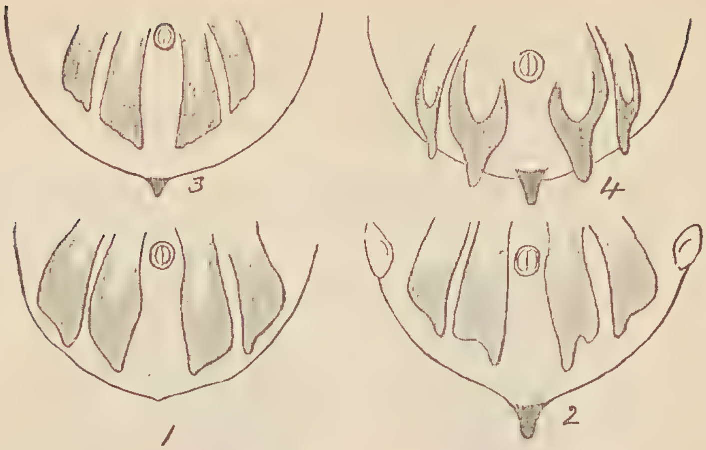
Neumann ; 2, 3, and 4 original.)

4\. A. Male with the shield extending to the posterior margin :—*R. annulatus, caudatus, decoloratus, australis.*
B. Male with the shield not extending to the posterior margin (Neumn.) :—*R. evertsi.*

(This appears to be a ready feature for distinguishing *evertsi* from *decoloratus.*)

5\. A. Male with a distinct horny "tail" :—*R. caudatus, decoloratus,* and *australis.*
B. Male with a small caudal protuberance :—*R. evertsi.*
C. Male with no indication of a "tail" :—*R. annulatus.*

(The absence of a tail to the male of *annulatus* readily separates it from the other species.)



Diagrams of Posterior Ventral Margins of Males.—(1) Of *annulatus*, (2) of *caudatus*, (3) of *australis*, and (4) of *decoloratus*, showing ad-anal shields and "tails." (1 and 2 after Neumann; 3 and 4 original.)

From the differences in the various characters, brought out in the above tables, I have felt myself justified in re-establishing Koch's *R. decoloratus*, and in regarding the Australian tick as a new species. The following brief descriptions will, I think, suffice for the recognition of *australis* and *decoloratus*:—

Rhicephalus decoloratus, Koch. ("Uebersicht des Arachnidensystems," page 134.)

Female: When replete, 10-12 mm. in length, and 6-8 mm. in breadth. Colour uniform, slate-blue. Shield of the same form as that of *annulatus* and *australis*, but smaller; furrows at first converging, then diverging to the posterior lateral margins; median region of a light-yellow colour, laterals red. Eyes not distinct. Labium with six rows of teeth. Mandibles with lesser process bi-cuspid, and presenting a rounded process as well. Legs generally yellowish, often red.

Male, adult: Pale-brown and almost transparent, sometimes dark-brown. Length, 2-3 mm. Labium with six rows of teeth. Ad-anal shields four, of the usual form but more chitinous than those of *annulatus*, and prolonged into strong conical points. Abdomen ending in a strong chitinous caudal appendage.

Hab.: On horses, cattle, &c. Cape of Good Hope.

Rhipicephalus australis, n.sp.

Female: When replete, measuring 10-11 mm. in length and 6-7 mm. in breadth. Dorsal shield smaller than that of *annulatus* and greater than that of *decoloratus*, of the same form and with similar furrows. Eyes, pale. Labium with eight rows of teeth. Mandibles with the lesser process tri-cuspid, and presenting a rounded process as well.

Male, adult: Approaching that of *annulatus*, but with ad-anal shields more chitinous, and also exhibiting a caudal appendage. Neither the shields nor the "tail" are so pronounced as those of *decoloratus*.

Hab.: On horses, cattle, &c. North-west to north-east Australia.

Mr. Fuller also says:—"For some time now there appears to have been doubt as to the identity of the Redwater Ticks of Australia and North America with one another and also with the supposed carrier of Redwater in

Cape Colony—the Common Blue or Blood Tick. With the object of settling this point, at any rate so far as the common species in Cape Colony is concerned, a careful study has been made of these three forms, and the following notes are the results of these comparisons :—

"The fact that Redwater is carried from beast to beast by the agency of ticks was discovered but a few years ago by official investigators in the United States of America, where the disease has been the direct cause of great losses from time to time. These investigators found that one kind of tick, *Rhipicephalus annulatus* (Say) or as it is more commonly known, *Ixodes bovis*, was the agent which disseminated the disease, and proved that not only did the bites of the ticks produce the disease, but further that the disease, or power of producing it, was communicated from the maternal tick through its eggs to the young. Subsequently when this Redwater broke out in Queensland, Australia, it was found associated with a tick which many of us regarded as identical with the American one, and as this tick spread from district to district, so the disease spread with it. In Cape Colony, Redwater has been gradually extending its range from the north along the eastern seaboard, and the common blue or blood tick is no doubt the chief distributing agent. This species is referred to as the supposed or chief distributing agent of the disease because of the great possibility that it is not the only agent, nor the only tick, for there is a probability that some, if not all, of our other common species, such as the larger Blue, the Red, and and the two Bontes, may also act as transmitters; a probability enhanced by the fact that these investigations have shown that the Australian, the North American, and the local Common Blue, though closely allied and of the same genus, are distinct species. But as, up to the present, there does not appear to be any conclusive technical evidence upon this important point, I venture to draw attention to it as being a question invested with so much interest and practical importance, that it is well worthy of attention, particularly in Cape Colony, where the opportunities of investigating it are so great.

"Another interesting feature is that whilst in Australia and, I believe, the United States too, the ticks were strangers to those parts to which they carried the disease, such is not the case in Cape Colony. Our Blue Tick (*Rhipicephalus decoloratus*, Koch) occurs in many parts of the colony, and is found where, I am given to understand, Redwater has never been known and where cattle could not have become immune. That the ticks are actually dissociated from the disease in these parts is proved by the fact that imported cattle do not contract Redwater when brought into contact with the native cattle. In Australia and North America the ticks have never to my knowledge been reported as so dissociated from the disease, and fever-stricken cattle were always infested with a particular tick, and unless a beast was actually immune by birth or had become so by previous infection or inoculation, the bites of these ticks were followed by the fever. There are, however, in both countries, particularly in the more southern and warmer parts of the United States, parts where tick-infested cattle exist in great numbers and do not suffer from acute Redwater. These cattle are, however, natives, and inherit their immunity from the disease while still carrying in their blood, its 'germs.' From them the ticks are known to take the disease to susceptible cattle either when mixing with these other cattle or grazing over the same ground within a certain period after they have crossed it. These susceptible animals have the disease carried to them by the young or larval ticks hatching from the eggs laid by those dropping from the former cattle. Ground travelled over by the cattle which carry the disease in their blood, remains infected with the disease only so long as it is infested with these larvæ, and this period is limited by the length of time that they can live without food. This again, providing there is no reinfestation, is more or less extended according to climatic conditions,—heat and cold, dryness and dampness; young ticks being very subject to such variations and capable of living a great while when they are favourable.

Ground is said to remain infested for as many as six months in winter and two in summer in the case of the American Redwater tick, of which it is recorded that:—*

"(1.) The delay in the beginning of egg-laying is nearly three weeks in winter as compared to twenty-four to forty-eight hours in summer.†

"(2.) The time elapsing between the laying of the first and the last egg by a female is, in summer temperature, only a few days, while in winter it may extend over a period of five weeks.

"(3.) In winter incubation is almost suspended, and months may elapse before hatching takes place. In summer the normal incubation period is about twenty days.

"(4). Seed ticks (larvæ) are capable of existing without food four and one-half months in winter; in summer the time survived was about two months.

"The short summer period does not, I am told by Mr. Hutcheon, C.V.S., actually apply to all our local conditions, as there are certain evidences of veldt remaining infected for far greater periods."

*The following information is quoted from Bulletin 51 (2nd Ser.) of the Louisiana State University and A. & M. College. The Cattle Tick and Texas Fever, by W. H. Dalrymple, H. A. Morgan and W. R. Dodson. Bâton Rouge 1898.

†In the case of the Bonte Poorten Tick (*Amblyomma hebræum*, Koch) we find that there was a delay of from two to three months in beginning egg-laying in winter (May to July), and about a week in summer (January).

Animal Pathology.

TUBERCULIN: ITS HISTORY, PREPARATION, AND USE.

BY C. J. POUND, F.R.M.S.,
Director of the Queensland Stock Institute.

[*Read before the Royal Society of Queensland*, 17*th December*, 1898.]

EVERY day brings forth evidence of the prevalence of tuberculosis among cattle, in every country throughout the civilised world, but it is particularly interesting to note that by far the greater number of cases have only been detected by means of that most invaluable agent, tuberculin.

HISTORY.

In 1882, Robert Koch, the eminent German Bacteriologist, announced that he had discovered a special bacillus in tubercular tissues, which he isolated and cultivated artificially in or on specially prepared nutrient media outside the animal body; also, that he could reproduce the disease by means of inoculation with the cultivated bacillus. Subsequent investigation proved that the bacillus of human consumption was identical with that which caused tuberculosis in cattle.

In 1890, Koch made another interesting discovery, viz.:—That the isolated poisonous products of the tubercle bacillus were: (1) capable of preventing the effects of the inoculation of tuberculous material, (2) of healing in certain manifestations of tuberculosis in the early stage, and (3) of indicating the presence of tuberculous lesions, when all other methods of diagnosis entirely failed.

Tuberculin is the name given by Koch to the glycerine extract of the poisonous products of the tubercle bacillus.

Although there are some authentic cases of tuberculosis in the early stages in human beings that have completely recovered after treatment, generally speaking tuberculin, as a cure, has not come up to expectations, but

it has been definitely proved, by means of thousands of experiments in every part of the world, that tuberculin is capable of detecting the existence of tuberculosis in cattle even in the very earliest stages of the disease.

During the last three years the somewhat exhaustive experimental investigations conducted at or in connection with the Queensland Stock Institute have shown that when the tuberculin test is applied with judicious care, it is practically infallible; moreover, it has proved itself of such incalculable benefit to stockowners, and is so very easy of application when the details are understood, that the following description of its nature and use will, I trust, be found acceptable to all interested in cattle, from the breeder of stud animals to the dairy farmer.

By means of this information, a stockowner should be in a position to test his own cattle; but it is advisable, first of all, to receive some practical instruction, and see the test several times applied by one of the officers attached to the Queensland Stock Institute.

Up till 1893 tuberculin was only prepared in Koch's Laboratory, in Berlin, but when the nature of its composition became known, and it was pointed out by Nocard and Roux, of the Pasteur Institute, that tuberculin must ultimately come into general use for detecting tuberculosis in cattle, it was not long before this agent was prepared in several other institutions. At the present time tuberculin is prepared on a very extensive scale, specially for diagnostic purposes, by the following institutions:—Koch's Laboratory, in Berlin; Pasteur Institute, in Paris; Bang's Laboratory, in Copenhagen; Royal Veterinary College and the Institute of Preventive Medicine, in London; Bacteriological Laboratory of the Bureau of Animal Industry, Washington, U.S.A.; and Board of Health Laboratory, New York; while in the Southern Hemisphere, the Stock Institute in Brisbane claims to be the first and only place where standardised tuberculin is prepared, practically speaking, on a scale to meet the demands of all Australia.

THE METHOD OF PREPARING TUBERCULIN IN THE STOCK INSTITUTE.

Tuberculin is a sterilised, filtered glycerine extract of pure cultivations of the tubercle bacillus. That which is prepared in England, France, and Germany is made from cultures of the bacillus growing in peptonised beef broth, containing from 6 to 8 per cent. of pure glycerine, as per samples exhibited. When I first commenced in an experimental way preparing tuberculin in Brisbane, I adopted the same kind of nutrient media; but in consequence of the various lots of beef from which boullion was prepared, varying so much in quality, more particularly the necessary salts of serum, which very materially interfered with the standardising of the resulting tuberculin. I endeavoured and succeeded in preparing a special form of nutrient media, made up of pure chemicals, the whole being analogous in composition to the very best quality beef.

Pure peptone, an important and expensive item in the old nutrient media, is disregarded in the new formula, thereby considerably reducing the expense of turning out a first-class article.

The most important point is that, whenever we wish to prepare fresh batches of tuberculin, we always have the satisfaction of knowing exactly to a day when to filter our culture, providing, of course, the regulators attached to the incubators have maintained an even temperature throughout the period required for obtaining the desired amount of growth of the tubercle bacillus.

The following is the formula of the nutrient media used in the Stock Institute:—

Magnesia sulphate	0·2	grammes
Acid potassium phosphate	1·0	,,
Ammonium phosphate	10·0	,,
Sodium chloride	10·0	,,
Asparagin	2·0	,,
Glycerine	70	cc.
Distilled water	1,000	cc.

It will be noticed that there is no albumen material present, while the nitrogenous element is supplied in the asparagin.

Having prepared a stock of the above material, it is transferred to a number of 50 cc. Erlenmyer's conical shaped flasks which have been previously chemically cleaned, plugged with cotton wool and sterilised.

It is necessary that, in order to obtain as large a surface of the fluid exposed to the air, only 20 cc. of the nutrient media be placed in each flask.

The flasks and their contents are sterilised on four successive days for 20 minutes at each operation, in a steam steriliser at 212 degrees Fahr., or for 30 minutes on two successive days in an autoclave or steam digestor, under a pressure of 27 lb. on the square inch. On removal they are allowed to cool down, when each flask is ready to be inoculated with the pure culture of the tubercle bacillus, which to perform for the first time is an extremely difficult and tedious operation. Night after night, for many weeks at a time, I have worked away by myself in the laboratory in order to perfect this operation.

If we take a trace of the growth from the surface of an agar-agar culture of tubercle bacilli, and place it into the flask, it gradually sinks to the bottom of the fluid; if this flask of inoculated media is placed in an incubator we have to wait many months before we see a perceptible increase in the growth of the colony of tubercle bacilli, the reason being that the organisms have not had free access to oxygen, which is absolutely essential for their rapid development. Although this specific bacillus is recognised as one of the slowest growing organisms, we have succeeded in obtaining most luxuriant cultivations by growing it on the surface of this fluid media. In the first place this is only accomplished by inoculating from an old and very dry agar-agar culture, a very large number of flasks, special care being exercised to make the minute traces of growth of bacilli float. After the flasks have been in the incubator for about three weeks it is possible to find, out of 100 flasks, perhaps one flask with an extremely delicate film, almost imperceptible to the naked eye, floating over a small portion of the surface fluid. Should a microscopical examination of this film, after staining with special aniline dyes, result in showing nothing but a pure culture of the tubercle bacillus, immediate steps are taken to transfer, by means of a flattened platinum needle, portions of this film to the surface of fluid media in each of the other flasks, which are afterwards returned to the incubator where they remain at 98·6 degrees Fahr. for another 10 weeks. On examination at intervals during this period, it will be noticed that the film, which has grown all over the surface of the fluid media, becomes crinkled, breaks up gradually; then a new film forms, and so on, until the growing bacilli have exhausted all the nutrient properties in the fluid media, at the same time generating or setting free their poisonous products, the tuberculin. The next part of the process is to carefully destroy the vitality of every bacillus in the culture and then separate them from the fluid by passing the contents of each flask through a Pasteur-Chamberland filter, under a pressure of 500 lb. on the square inch.

This porcelain filter, the manufacture of which is practically a French Government secret, is so uniform and fine in texture that the very smallest spores of bacilli or micrococci known to bacteriologists cannot be forced through even under this enormous pressure.

This filtrate is now placed in a series of Florence flasks, fitted with perforated rubber corks, and connected one with another to a Sprengel's exhaust pump by means of glass and thick-walled rubber tubing. The flasks thus connected are placed in a steam steriliser and kept heated up to a temperature of 120 degrees Fahr., while the exhaust pump assists in evaporating the contents of the flasks *in vacuo* until the fluid is so concentrated that the glycerine, originally in the proportion of 7 per cent., amounts to 50 per cent.

The next part of the programme is the standardising, and requires the greatest care and attention, inasmuch as it can only be performed by a large series of physiological experiments on guinea-pigs.

The 50 per cent. glycerine in the finally standardised tuberculin will prevent the development of any foreign micro-organisms which may gain access to the glass bottle when the stopper is removed; moreover, if this material is kept in a cool, dark cupboard, no alteration takes place with regard to its chemical composition and its physiological effects upon tubercular animals.

Some tuberculin prepared in November, 1895, and kept under favourable conditions, has not deteriorated in the slightest degree, and is just as efficacious for diagnostic purposes as when it was first prepared.

THE USE OF TUBERCULIN AS A MEANS FOR DIAGNOSING TUBERCULAR DISEASE IN CATTLE.

Tuberculin as a test agent is always used in the diluted form, in the proportion of 1 part tuberculin to 19 parts of a 5 in 1,000 carbolic acid solution.

Of this diluted tuberculin the following doses are required for different animals:—

8 cc. for bulls, high-class and aged animals.
6 cc. ,, medium-sized animals.
4 cc. ,, calves six to twelve months old.
2 cc. ,, calves under six months.

Example of method of diluting tuberculin:—$\frac{4}{10}$ cc. pure tuberculin to $7\frac{6}{10}$ cc. carb. sol.=1 to 19.

APPLIANCES REQUIRED.

Syringe.—A strong well-made hypodermic syringe holding 10 cc. with a strong needle attached; that used in connection with preventive inoculation for tick fever is specially recommended.

Thermometer.—For taking the temperature a clinical thermometer is necessary, as this form has a self-registering index, but as the ordinary medical thermometer is such an extremely delicate instrument, and very liable to be broken, a special strong thermometer, suitable for taking the temperature of cattle and horses, has been designed and approved of by the Stock Institute.

Thoroughly sterilise the syringe and needle (*i.e.*, destroy all germs that may be in or on them) by soaking them in 5 per cent. solution of carbolic acid.

THE APPLICATION OF THE TEST.

The diagnoses of tuberculosis in cattle by means of this test depends entirely upon the characteristic elevation of temperature produced in a tuberculosis animal within a limited period after injection.

This constitutes the only real difficulty, for, while determining that an abnormal rise in temperature has taken place, due allowance must be made for variations within the normal range of temperature and for those produced by causes other than the injection of tuberculin, for instance:—

(*a*) As a rule young animals are much warmer than old animals.
(*b*) The temperature of the surrounding atmosphere, especially during the summer months, affects different animals unequally.
(*c*) The drinking of cold water lowers the body temperature for sometimes over an hour afterwards.
(*d*) The presence of other diseases.
(*e*) The approach of calving.
(*f*) In the case of cows in heat, the temperature of the body is usually abnormal.
(*g*) Excitement due to fast driving.

Having due regard to the above facts, it is recommended that all cattle except those manifestly too ill should be tested.

According to very numerous exhaustive experiments, even cows in the last stages of pregnancy do not seem to react from the tuberculin injection unless they are tuberculous.

When, however, the preliminary temperature before injection is above 104 degrees, the animal may be temporarily passed and tested on a subsequent date, but if it is suspected that the high temperature is due to a tubercular condition it is advisable to proceed with the test.

By following a fixed rule the work becomes, so to speak, automatic, and greater accuracy is obtained if the following order of procedure is observed:—

I. Place all the animals to be tested in bails or a crush, and have them marked.

II. Take the preliminary temperature at 2 p.m. and 6 p.m. on the day of injection.

III. Inject the tuberculin at 6 p.m.

IV. Take the temperatures every three hours from 6 a.m. to 6 p.m. on the following day, or until there is no further rise of temperature, and the normal level has been resumed.

USING THE THERMOMETER.

The temperature of cattle, as well as all other of the lower animals, is taken in the rectum. Before inserting the thermometer be sure that the mercury stands below 97 degrees Fahr.

With the left hand, firmly but gently grasp the animal's tail about 8 inches from its root; lift it slowly just high enough to permit access to the anus.

The bulb and lower part of the thermometer may be moistened with saliva, lard, glycerine, oil, or vaseline, to prevent its sticking to the mucous membrane of the rectum. When inserting the thermometer avoid catching the bulb in a fold of mucous membrane by changing its direction either to the right or left, or upward or downward as occasion requires. It has been found that the thermometer is best introduced in an upward direction. The thermometer should be pushed into the rectum sufficiently far so that it can be easily withdrawn, and yet evade the swinging motion of the animal's tail when the latter is released.

The thermometer should remain in position at least four minutes.

Injecting the Tuberculin.—When the syringe is filled and the proper dose set, the operator should take his place, if the animal is in a bail, by the right shoulder of the animal, or on the side opposite to that in which he intends to inject. Reaching over the animal with the left hand, he must pinch the skin firmly at the chosen point with the left thumb and forefinger. With the syringe resting in his right palm, the needle between the thumb and forefinger, he pierces the skin with a quick thrust, and while retaining hold of the folded skin, the piston is taken with the right thumb and the contents of the syringe slowly introduced into the subcutaneous tissue.

The Reaction.—It may be affirmed that an animal has tuberculosis if its temperature rises 2·5 degrees Fahr., or more, on the day following the injection.

If there is any rise less than this, a repetition of the injection after three or four weeks is desirable,

As a rule, with tubercular animals the temperature in a typical case will begin rising twelve hours after injection—*i.e.*, at 6 a.m.—and by noon may reach 107 degrees Fahr.

One point worth remembering is that, generally speaking, the smaller and fewer the lesions of tuberculosis, the greater and more certain is the reaction produced, while on the other hand cattle suffering from advanced tuberculosis will give only a slight reaction; in fact, it is very often observed that in the very latest stages of the disease the animal may show no reaction whatever. This is explained by the fact that the animal, in consequence of the generalised form of the disease, is so literally saturated with tuberculous products, that the very small amount of tuberculin injected fails to excite the tissues. It is also worthy of mention that, as such advanced cases do not require tuberculin injection to discover their diseased condition, this source of failure does not count against the value of the test.

TABLE SHOWING TEMPERATURES BEFORE AND AFTER INJECTION OF TUBERCULIN OF A HEALTHY AND A TUBERCULOUS ANIMAL.

Healthy.

Before Injection.		After Injection.	
9 a.m.	102·4	†6 a.m.	100·6
12 noon	100·8	9 a.m.	101·2
3 p.m.	101·4	12 noon	101·4
*6 p.m.	101·6	3 p.m.	101
		6 p.m.	102·1

Tuberculous.

Before Injection.		After Injection.	
9 a.m.	102·1	†6 a.m.	103·1
12 noon	101·8	9 a.m.	105·8
3 p.m.	101·7	12 noon	106·9
*6 p.m.	102·3	3 p.m.	106·1
		6 p.m.	104·8

At the present time there are many different brands of tuberculin (each of which possesses its own particular properties) obtainable from various commercial agents in each of the colonies; but it is specially recommended that, in order to obtain uniform results, only that tuberculin should be used which is prepared and supplied by the Stock Institute: precisely on the same lines that in Germany only Koch's tuberculin is used; while in Denmark the Government will only allow that to be used which is prepared under the direction of Professor Bang, at Copenhagen; and in the United States the Government specially recommend that prepared in the Laboratory of the Agricultural Department.

The overwhelming evidence collected in different countries throughout the world has shown that the use of tuberculin as an aid to the diagnosis of tuberculosis in cattle is one of the most brilliant discoveries of the nineteenth century, and, as time passes, its real value and significance will be more and more appreciated by the masses of mankind.

Now that this test has proved itself to be almost infallible, it should be the desire of every person interested in cattle to commence at once in a judicious and systematic manner and eliminate from his herd, with the least possible loss, every tuberculous animal, not forgetting the obligations to the public both in the exchange and sale of live stock and products, both of which should be guaranteed free from tubercular taint. At the same time special attention should be directed to the preservation of certain strains of well-known and productive blood, which have taken many years of intelligent thought and careful study by the most observant minds to bring up to their present high standard of perfection.

HOW TO ELIMINATE TUBERCULOSIS FROM A HERD.

The following is the method, based on the practical experience of such keen observers and eminent scientists as Professor Bang, of Copenhagen, Professor McFadyean, of London, and Dr. Salmon, of Washington, I have adopted for the eradication by tuberculosis from the dairy herd at the island of St. Helena:—

I. All animals showing outward signs of disease should be immediately killed and the carcasses destroyed by fire.

II. The remainder of the herd tested with tuberculin every six months.

III. All animals of little value, such as old cows or bulls and very young calves that have shown evident reaction to the test are carefully slaughtered and examined, and the whole carcass thoroughly boiled down as food for the pigs.

* Injection took place at 6 p.m. † Twelve hours after injection.

IV. The remaining reacting animals are carefully separated from the healthy animals by removing them to some distant isolated paddock.

V. On large estates it is recommended that a separate set of attendants should look after the cattle for each division.

VI. Where, however, one man milks and cares for all the cows, he should serve the sound division first; then he changes his shoes and outer garments for special clothing used only in the diseased division.

VII. The sheds and stalls occupied by the cattle in both divisions are cleaned and disinfected as follows:—

(a) All manure and litter is removed out of reach of the cattle and burned, or treated in such a way that, by spreading it in a thin layer over cultivated land, the sun's rays can exert their germicidal influence.

(b) The entire interior of the buildings is disinfected by means of spraying, or washing with a large brush with the following mixture:—1 oz. of corrosive sublimate (bichloride of mercury) to 8 gallons of water. After disinfecting the interior and edges of the mangers, they should be washed with water.

(c) After an interval of a few days all the woodwork, including partitions, stanchions, walls, and ceilings are whitewashed, the mixture containing in every 4 gallons 1 lb. of chloride lime and $\frac{1}{2}$-oz. of corrosive sublimate.

VIII. All calves born of reacting mothers should at once be put into the healthy division before they get a chance to suckle their mothers, and can be fed either on the milk of the guaranteed healthy cows, or with milk from their own mothers—but only after it has been heated up to a temperature of 190 degrees Fahr. for 30 minutes.

IX. When any animal in the reacting or diseased division shows signs of sickness, it should be destroyed.

X. No new animal should be introduced into the healthy division unless it has passed the tuberculin test.

XI. Avoid breeding from very young or too old cows, as the offspring is apt to be weak and puny.

XII. No consumptive person should be allowed to work amongst the cattle or prepare their food.

CONCLUSIONS

By following these rules, the unsound animals will be wiped out, but hardly before they have replenished the healthy divisions to its original dimensions. Of course if only a few animals are found tuberculous, it will not pay to go to the trouble and expense of keeping them as a separate herd; but when dealing with a considerable number of valuable prize animals, whose qualities are worth propagating, it will undoubtedly pay, as demonstrated by several authorities, to adopt the above method.

It is simply a question of which is the cheaper course in the end—to try and raise a sound herd from an unsound one by observing rigid rules, or to get rid of all the tuberculous animals at once. Each stud-breeder or dairy-farmer must determine this for himself, and in doing so must not overlook the fact that heredity and predisposition are mere minor factors in the production of tuberculosis.

FRAUDULENT PRACTICE IN CONNECTION WITH THE TUBERCULIN TEST.

To those who have devoted several years in watching the practical working of the test, it was quite easy to see how readily frauds might be and, in fact, have been perpetrated by evil-disposed persons, and it is only right, in my opinion, that the method of working these frauds should be exposed.

It is a well-established fact that if a tuberculous animal has been injected with a large dose or with repeated frequent small doses of tuberculin, it will fail to give a reaction temperature on a subsequent testing, unless a considerable period (many months) is allowed to elapse for the previous dose of tuberculin to be eliminated from the system.

The following examples serve to illustrate how simple a matter it is for animals to be fixed up and sold, in such a manner that the purchaser is perfectly satisfied that they are absolutely free from tuberculosis :—

CASE I.

Mr. A—— has a well-bred Ayrshire bull for sale.

Mr. B——, an intending purchaser, comes along and says to Mr. A——: "I like the appearance of that bull; in fact, I have taken a great fancy to him."

Mr. A—— says: "Well, you can have him for a ten-pound note."

"All right," says Mr. B——, "but now-a-days I get a bit particular; I will take the bull on condition that you test him with tuberculin and he shows no reaction."

This is agreed to by Mr. A——, who invites Mr. B—— to come round in two or three days' time and witness the test being carried out.

Now comes the opportunity for Mr. A——, for as soon as his premises are vacated by Mr. B—— he injects a large dose of tuberculin into the bull, which he has previously proved, to his own satisfaction, has got tuberculosis in an incipient stage. The next day, of course, the bull reacts to the tuberculin, but the fact is only known to its present owner.

On the following day Mr. B—— comes back with the standard dose of tuberculin, which Mr. A—— very courteously allows to be injected into his bull; this is followed by a very careful and accurate record of the animal's temperature from the twelfth to the twenty-fourth hour after injection, with the result that there is no perceptible alteration from the normal before the injection.

Both seller and buyer shake hands and compliment one another on the success of the test, and Mr. B——, after paying his £10, wends his way homeward with his purchase, perfectly satisfied that he has a bargain in the animal which, in his opinion, is free from tuberculosis.

CASE II.

Mr. C—— is anxious to buy a dairy cow for the purpose of supplying milk to his family.

Mr. D——, a breeder of dairy cattle, is also anxious to meet the requirements of Mr. C——, and allows him to select any cow in his herd at a certain price.

Accordingly Mr. C—— picks out a three-quarter bred Jersey cow, and, as it is such a very quiet animal, he is desirous of having it tested with tuberculin without further delay.

The ever-obliging Mr. D—— at once produces the clinical thermometer and two small stoppered bottles—one bearing the characteristic label of Koch's tuberculin, and the other of Bang's.

Mr. C—— remarks that "as there is a great deal in a name, he prefers to use Koch's tuberculin"; consequently a definite quantity of the contents of the bottle labelled "Tuberculinum Kochii" is diluted with weak carbolic solution and injected into the selected cow; the records of the animal's temperature taken next day indicate that no reaction has taken place.

Mr. C—— then purchases what he conscientiously believes to be an animal which has been proved by the tuberculin test to be free from tuberculosis, and ever afterwards feels proud in informing his numerous friends how very much better it is, instead of having a limited quantity of inferior milk

supplied by a dirty careless milkman, to have, practically speaking, an unlimited supply of pure fresh milk from his own cow, which, he says, is guaranteed free from tuberculosis from the fact that it has passed the tuberculin test.

Little does Mr. C—— imagine that, although the stoppered bottles and labels are the genuine articles, the contents are cold tea placed there intentionally by that courteous gentleman, Mr. D——, who can rest assured that his cattle, whoever purchases them, will find no tuberculosis if tested with the tuberculin which he generously supplies at the time of purchase.

Should, however, an animal react to the genuine test soon after purchase, Mr. D—— will say: "Oh, yes! I have no doubt whatever about the correctness of the test, but you see the animal passed the test with me; therefore it could only have contracted the disease after it left my premises."

From the foregoing remarks it will be readily apparent that the supply of tuberculin should be strictly under Government control, and that the application of the test should only be carried out by experienced Government officials and duly qualified veterinary practitioners.

General Notes.

NOXIOUS BIRDS.

By many farmers, the magpie is looked upon as a nuisance, and is often destroyed. When country people get into the habit of studying the work performed for them by wild animals, birds, insects, &c., they will probably discover that many so-called nuisances are really blessings, and they will then determine to assist in putting down the city "sportsmen," who sally forth on a holiday and shoot every bird, large or small, that comes in their way. These mighty hunters have no hesitation in destroying laughing jackasses, mopokes, swallows, magpies, pied crows, and many other useful birds which it should be everyone's duty to protect to the uttermost. In Victoria lately a crop of onions amounting to 600 tons was harvested from 80 acres, some portions of the field yielding at the rate of 10 tons per acre. It is stated that had it not been for the labours of the magpies and one of the owners, the whole of the magnificent crop would have been destroyed by maggots.

BLUE MOULD IN TOBACCO.

A SINGULAR case of after-development of blue mould in the tobacco leaf occurred the other day. Some fine leaves were sent to Mr. Nevill, Government Tobacco Expert, and appeared to be quite free from disease. On their being dried, large spots of mould were developed. To account for this, Mr. Nevill said that, in all probability, the disease had just begun to attack the leaf when gathered, and only developed as it dried. The plants from which the samples were taken soon afterwards showed the disease well developed. By experiments made in Sumatra, "where," says Mr. D. McAlpine in his progress report to the Victorian Agricultural Department on the treatment of blue mould, "the disease is known as 'bibil'—that being the native name of young plants before transplanting, at which time the disease is most virulent—it has been practically overcome by experiment." Bordeaux mixture was used. Its strength was 1 lb. bluestone and 1 lb. fresh unslaked lime to 5 gallons of water, but Mr. McAlpine recommends that it be made in the first instance of

half the strength by using 10 gallons of water. The morning is the best time for spraying, just after the dew has disappeared, and the plants should not be watered either immediately before or after the spraying. Since the spores may reproduce the fungus in from five to seven days, spraying should be repeated at intervals of a week. Dr. de Haan, of Deli, Sumatra, says that by the use of the spray mentioned, and by rational change in the seed-beds, the disease has been checked in its outbreak and spread. By taking these preventive measures, and by good care and supervision, the disease has lost its serious character, and only occurs sporadically.

GARLIC CEMENT.

It is not generally known that the expressed juice of garlic makes an excellent cement for broken glass and china. The juice must be applied as soon after breakage as possible, as the edges of the broken parts become worn away by friction. This makes an everlasting cement, and if the edges are neatly joined no sign of a fracture remains. The expressed juice of an onion also makes a very good adhesive fluid.

HOW TO CHOOSE ORANGES.

The sweetest oranges generally have rusty-looking coats. An English expert says:—"Pick out the dingiest in the box, and you will get the best." Another test is weight. The heaviest oranges have the thinnest rinds. Thick-skinned fruit is apt to be dry inside. A slight freezing on the tree causes this condition in otherwise fine fruit. The "kid-glove" oranges are the two varieties grown in Florida from stocks respectively brought from China and Tangier. The Glen Retreat orange of Queensland is a very fine-skinned heavy orange, and is amongst the best, if not the best, of our mandarins.

VICTORIAN WHEAT HARVEST.

The Government Statist's figures relating to the wheat crop of 1898-99 show that the total area harvested for wheat was 2,079,410 acres, an increase of 421,960 acres on the previous year. The yield is placed at 19,557,532 bushels, and the average per acre at 9·41 bushels. In the mallee country, where 600,000 acres are under wheat, the averages for the Karkarooc and Tatchera counties were low, being respectively 3·47 and 4·67 bushels.

NEW SOUTH WALES HARVEST.

The total area under wheat in New South Wales in 1898-99 was 1,605,000 acres, of which 1,301,000 acres were cut for grain. The production of wheat was 9,232,000 bushels, and the average return per acre 7·2 bushels.

THE PRICE OF MAIZE.

With the increase in the manufacture of smokeless powder, better prices would appear to be in store for maize-growers. One of the ingredients required for this powder is alcohol, and the cheapest alcohol is distilled from maize. There has arisen an unprecedented demand for this spirit. Japan lately bought 50 car-loads of alcohol, so says Mr. E. B. Powell in the *New York Independent*. Russia and Germany are also purchasing heavily. The United States is also buying extensively for the purpose of making their own powder. Seeing that corn is now being so largely used for the production of alcohol, and that the late crops in Australia have suffered so severely from drought, the price of maize during the coming winter will probably keep up to an abnormal figure. Against this we note that the corn crop in the Argentine is simply magnificent, and can scarcely be injured by locusts to any material extent, as it is very far advanced for the time of year, and there are absolutely no locusts in the most important maize-growing districts.

POISONING BY KAFIR CORN.

A CORRESPONDENT at Toowoomba writes corroborating the Government Botanist's (Mr. F. M. Bailey) opinion that there is no poisonous principle in Kafir corn. Last month, he says, twelve of his horses got into a small paddock of Kafir corn which was just coming into flower. They remained there all night, and in the morning, beyond looking considerably blown out, no evil effects were observed, nor did the animals subsequently suffer in any way. All evidence goes to show that no animals are poisoned by over-indulgence in this fodder, but that in some cases "hoven" may result.

CURE FOR MANGE IN DOGS.

A CORRESPONDENT of the *Australian Farm and Dairy* gives the following recipe for curing dog mange, and, having applied it himself to mangy animals, vouches for its thorough efficacy. The cure is: Wash the dog with strong lime water. Prepare some lime water and let it stand for a few days until the burning power has gone off, and then, with a sponge or brush, soak the dog all over, taking care, however, that the lime water does not get into its eyes. If you have got a tub, the quicker way will be to mix half-a-tubful of lime water and wash the dog in it, keeping its eyes protected. This will also destroy fleas. If the lime water is used the day it is mixed, it will turn the hair brown, although doing no injury to the skin, even should there be a raw place. This cure is far superior to the old dressing of oil, &c. The lime water penetrates through any coat of hair, and unlike the oil, which is filthy for two or three days, dries quickly. Even if the dog rolls in the dirt at first, as it probably will, the dirt falls off, and it is thoroughly clean again. Before condemning this remedy because it is simple and cheap, dog-owners should give it a trial.

Although, however, the writer of the above has found it an efficacious remedy, it must be borne in mind that it may not succeed in other cases for he reason that climatic influences have to be considered in overcoming the disease. What may answer for the south of Australia would probably not succeed in the far north, nor perhaps in Northern Europe, although possibly in the south of that continent the remedy might be valuable. The ordinary Australian mange, which is patchy, has been cured by the application of very dilute nitrate of silver. This remedy, however, can obviously only be applied in the case of an animal whose skin is merely affected in small infrequent patches. Carbolic acid was once stated to be, like the above, a double remedy for mange and fleas. Many years ago the late Sir Charles Lilley's sons possessed a valuable little dog which had become affected in this manner. They treated it, on the advice of a friend, with carbolic acid, but, not being much acquainted with the nature of the acid, they not only killed the dog, but were severely burnt about the hands. In cases of diseases of animals, we would strongly recommend owners to avail themselves of the services of a qualified veterinary surgeon in preference to indulging in amateur doctoring, which often results in the destruction of an animal worth many times the surgeon's fee.

CURIOSITIES OF PLANT LIFE.

SAGO, in the dialect of Amboyna, signifies meal. It is the pith of a species of palm, a single trunk of which will sometimes produce 600 lb. Nearly allied to sago is the cassava, a starch prepared from the *Jatropha manihoc;* the milky juice is poisonous, but the starch which it deposits is harmless.

The field pea was introduced into England in the time of the Romans. Garden peas came in with Queen Elizabeth; and in 1812 five guineas per quart were paid for them owing to the backwardness of the season.

The Jerusalem artichoke is a name corrupted from the Italian *Girasole Articiocco*—sunflower artichoke—the plant having been first brought from Peru to Italy, and thence propagated throughout Europe.

Strawberries are indigenous to Britain and other northern countries of Europe. They were not cultivated until about the year 1828, and then there were only five or six sorts known. The largest of these was the Hautbois, so called from being originally found in the *haut bois* or high woods of Bohemia. Now, by crossing, change of climate, and situation, there are as many hundreds of varieties.

The clove is the unexpanded flower of the *Caryophyllus aromaticus*. It has been brought into the European market for more than 2,000 years. The plant is a native of the Moluccas and other islands in the Chinese Seas. A fine tree has been known to yield 125 lb. of this spice in a single season, and, as 5,000 cloves only weigh 1 lb., there must at least have been 625,000 flowers upon this single tree.

The total annual production of tobacco is estimated at 2,000,000 tons, and would require half the British tonnage which "enters inwards" and "clears outwards" annually to transport the same. The value, at only 2d. per lb., would be £37,000,000 sterling. The comparative magnitude of this 2,000,000 tons will strike the reader more forcibly when we state that the whole of the wheat consumed by the inhabitants of Great Britain—estimating it at a quarter per head, or in round numbers at 20,000,000 quarters—weighs only four and one-third million tons; so that the tobacco yearly raised for the gratification of this one narcotic appetite weighs as much as the wheat consumed by 10,000,000 Englishmen, and reckoning it at only double the market value of wheat, or 2d. per lb., it is worth in money as much as all the wheat eaten in Great Britain.

Orange-trees are exceedingly long-lived. In the orangery at Versailles (near Paris) is a tree raised from seed sown in 1421. There is another in the yard of the Convent of St. Sabina, at Rome, said to have been planted by St. Dominic in 1200. In the neighbourhood of Finale is an orange-tree which bears nearly 8,000 oranges in a single year. In Holland there are many orange-trees which have been in the same family for from 200 to 300 years.

HEATING CAPACITY OF WOOD.

THE *River Plate Review* says that a writer in the *Staats-Zeitung* corrects a very common supposition in regard to the heating capacity of wood, the most notable fact in the case being that such a practicable and easy demonstrable error should so long have prevailed—namely, that the heating capacity of hardwood is greater than that of softwood. The fact, as ascertained by repeated determinations, is that the greatest heating power is possessed by one of the softest varieties of such material—viz., the linden. Taking its heating capacity by the unit, the second best heater is also a softwood:—Fir, with 0·99 heating power; next follow the elm and pine, with 0·98; willow, chestnut, larch, with 0·97; maple and spruce fir, with 0·96; black poplar, with 0·95; alder and white birch, with 0·94 only; then come the hard oak, with 0·92; the locust and the white beech, with 0·91; and the red beech, with 0·90. These examples leave no doubt of the general fact that hardwood heats the least.

LEICHHARDT GRASS.

THE Melbourne *Leader* has an interesting note on the Leichhardt Grass (*Paspalum dilatatum*), which can be used either in the pasture, or, if cultivated in drills, as a heavy yielding fodder crop, resisting both heat and cold, being much relished by stock, especially dairy cows, and shown by analysis to be of excellent milk-producing quality. Planted in drills 18 inches wide, and the seed 6 inches apart, a height of 5 feet has been reached, and a test cutting gave a yield at the rate of 12 tons 7 cwt. per acre. From another plot, drilled in as above in subsoil land, on 28th September, a cutting was obtained on the 3rd of the following June weighing at the rate of 19 tons 4 cwt. per acre, while subsequent cuttings yielded up an additional aggregate of 14 tons per acre. Mr. H. M. Williams, of Wollongbar, was one of the first to give this pasture and

fodder plant a careful trial after its earliest experimental farm tests. It is now four years ago, Mr. Williams states, since he sowed the first seed, but his farm is now practically covered with the *Paspalum*, and, to use his own words, "the more I see of it the better I like it. Of course, I mix other grasses and clovers as a change for the stock, but the *Paspalum* as a basis of the pasture has proved itself a mainstay for the stock, because it grows vigorously when hot weather withers up the other grasses. I have carefully observed it in all its stages and variations, and have come to the conclusion that *Paspalum dilatatum* is the very best grass for the farmer to rely upon as a permanent pasture, because after four years' grazing the paddocks are still improving and giving an increased quantity of feed. . . . A feature in favour of this grass is that it is not difficult to eradicate when a paddock is required for cultivation. One ploughing will not do this, but such cultivation as will bring the plant to the surface, followed by rolling and harrowing to free the roots from the soil, is found to quickly bring about its eradication by exposure to the sun. The plants are very tenacious of life if any soil is left on the roots, especially in wet weather, but as they do not grow from pieces of root, like couch and some other grass, plenty of cultivation and stirring during a few fine days is found to prevent further growth. Another point is that when the plants are far apart the grass grows into big tussocks, but as soon as the spaces between are all filled up it forms as regular a pasture as any of the other grasses."

EXPORT OF DANISH BUTTER.

THE quantity of butter exported from Denmark to Great Britain in 1885 was 42,289,632 lb. The quantity exported in 1897 was 149,489,312 lb.—*Engineer.*

EXPORT OF MUTTON FROM ARGENTINA.

IT is estimated that at the present time the Argentine Republic is raising annually nearly 700,000 tons more mutton than its own population can consume; 200,000 sheep are exported every month.—*Engineer.*

MEAT-PRESERVING IN BUENOS AYRES.

THE largest frozen meat factory in the world is at Barracas, a suburb of Buenos Ayres, and belongs to the Sansinena family. The establishment is capable of an output of 3,500 sheep per diem, or 100,000 mutton carcasses per month. The freezing-rooms have a capacity of nearly 100,000 cubic feet, and have hanging room for 6,000 sheep. The storerooms in which the sheep are stowed after freezing to await shipment have a capacity of 150,000 cubic feet, and can contain upwards of 50,000 sheep.—*Engineer.*

WIRE-WORM.

IN the case of heavy land pastures, which are said to leave a legacy of wire-worm on being re-broken, there is strong probability that the cake-feeding of stock, or the growth of heavy grass and hay crops, by the application of chemical fertilisers, would cause the land to be infested with much fewer pests, either animal or vegetable, than in cases of the soil not being kept up to a maximum state of fertility. And there may be another source of wire-worm engenderment, both on heavy and light lands—that of the want of deep-rooted grasses and clovers, and those being most general in the sward, which, like the rye grasses, send out their fibrous roots very near the surface. I believe it is a fact that a very large proportion of the farms that suffer most from wire-worm ravages are those where rye grass is commonly grown. Italian rye grass especially, if not lavishly fed with nitrogen, has been found to harbour and propagate the pest to an enormous extent, but, even when the roots of grasses of any kind are worse infested with the germs of wire-worm, burying the sward deeply under by the chilled digging plough before winter, and only submitting the land to surface working the following spring for a mangel crop, would most likely prove destructive to the vermin.—*Agricultural Gazette.*

SIR T. LIPTON AND SUGAR.

The Glasgow correspondent of a contemporary (says the *H. and C. Mail*) recently had an interview with Sir T. Lipton. Sir Thomas stated that the flotation of his American business may take place in March next (1899), but that, if certain circumstances arise, it may be delayed for a year. As to his West Indies sugar scheme, his experts are, he said, out there at present; and if their reports are satisfactory, he will erect central sugar factories. Sir Thomas further said that he meant to run the whole island of Barbados, and that, with the most modern machinery, he hoped to get a larger percentage of sugar out of the canes than by the present windmill propulsion. If sugar bounties are not increased, he calculates to sell cane sugar in Britain as cheaply as beet sugar.

EXPERIMENTS ON POTATOES.

Mr. E. B. Hodley, Agricultural Superintendent to the Wilts County Council, has issued a report on the potato experiments of the past season. The seasons during which these experiments have been carried on, he says, have been dry ones, and therefore more favourable to farmyard manure than to artificials, and the yield from its use has been considerably in excess of that obtained from the heaviest dressing (12¾ cwt.) of mixed artificial manures. Where nitrogen, phosphoric acid, and potash have been applied in artificials, excellent crops have been obtained; but the heaviest crop of all has been 14 tons per acre as the average of four years, grown where 8 tons of farmyard manure and 4 cwt. of sulphate of ammonia per acre were applied. The complete chemical manure was applied on different plots at the rate of 4 cwt., 8 cwt., and 12 cwt., respectively. Taking the averages for the four years, the 8-cwt. dressing proved the most economical, although the 12-cwt. dressing gave a somewhat heavier yield. When any one of the three constituents of the complete manure was omitted, there was a decrease of yield. Where the nitrate was omitted, the increase resulting from the application of the kainit and superphosphate was not sufficient to pay for the cost; where superphosphate was omitted, the application of nitrate and kainit gave but very little profit in excess of that obtained from the unmanured plots; and although where kainit was omitted the yield most nearly approached that obtained from the completely manured plots, yet even in this case the profit was less than that obtained with a cheaper dressing of complete manure.—*Agricultural Gazette* (*London*).

REMEDY FOR TICKS IN CAPE COLONY.

Messrs. R. W. Dixon, M.R.C.V.S., and J. Spreull, M.R.C.V.S., Government Veterinary Surgeons of Cape Colony, in a joint report on redwater experiments published in the *Agricultural Journal* of 24th November, 1898, say:—"We have found that the best method of destroying ticks and preventing their further invasion is to wash the animals over with a solution of Cooper's dip—1 lb. mixed with 20·25 gallons of warm water, to which is added 4 lb. of soft soap. The efficacy of this dip is the more lasting, because of the fact that the sulphur, &c., contained therein remains about the roots of the hair for some time, and we have noticed that fresh ticks becoming attached to the animal within a few days after its application often die. This dip has been several times repeated, and, in addition, the under parts have been frequently smeared with a greasy mixture containing Cooper's dip powder, sulphur, parafin, glycerine, carbon bisulphide, and lard."

THE PROPER SEASON FOR FELLING TIMBER.

To determine whether a tree was hewn in winter or in summer is of the greatest importance to buyers of timber, especially as regards building timber, since it is well known that timber cut down in summer represents a lower value than that felled in winter, says the *Allgemeine Tischler Zeitung*. Timber hewn during the resting period—*i.e.*, between October and April (June and

September in Queensland)—contains in its cells numerous starch particles which cannot be found in wood cut down in summer. Owing to this presence of starch, the wood is coarse and impenetrable, since the starch closes the pores. For this reason winter-hewn timber is exclusively employed for staves, because, with staves from summer-hewn wood, the contents of the barrels are subject to evaporation through the pores. The starch contained in the winter wood is given a violet colour by iodine. Hence, if the timber to be examined is coated with an iodine solution, and the surface of the felling side appears yellow, it may be assumed with certainty that the respective tree was cut down in summer. The light yellow lines are the moisture rays, while cells, tissue, and wood fibres simply take on a yellow colouring. In the case of winter-hewn timber the amylaceous rays form much darker, ink-coloured, black stripes on the yellow ground.

PROTECTING GRAPES.

It is no uncommon thing for vignerons to be mulcted in quantities of grapes during the season of the vintage by nocturnal robbers. The Italians guard against this by training their vines on barbed wire. In Southern Italy the vines are in many cases planted very few feet apart, and even in the daytime it is difficult for the legitimate owners to avoid contact with the barbs, whilst at night-time it is practically impossible. The wire used is of a very light description, as the lengths required are short, and of course no cattle have admission, being kept out by the boundary fences.

AN IMMENSE WINE TANK.

Owing to the crop of grapes in California last year having been larger than could be dealt with by the coopers, a means of storing the red wine at the Italo-Swiss colony's vineyard had to be devised. It took the form of a concrete cistern. An excavation was first made in a rocky hillside in the rear of the establishment. Next, walls of concrete 2 feet in thickness were put in, and the floor and top were added to it in equally substantial manner, the latter being supported by fifteen steel girders. Then the entire surface was covered with a lining of pure cement, and finally this was glazed to the impermeability of glass. The whole cistern was buried beneath 3 feet of earth, the object of all the precautions being to preserve the wine at a uniform temperature. This cement tank is 104 feet long, 34 feet wide, and 24 feet high, and is capable of holding 500,000 gallons. The wine (says the *Scientific American*) was kept in this reservoir for four months or more, and the experiment is said to have been entirely successful. It was then drawn off by gravitation into wooden tanks, in which it will be allowed to mature previous to being placed in barrels for shipment. There are said to be advantages derived from treating the wine in this manner. One is that it can be maintained at a cool even temperature; another is the equal blending of such a large quantity of wine at one time.—*Engineer.*

WET EARTH A BEE-STING CURE.

Mr. George Patullo, writing on the above subject, which was mentioned in the April number of the *Journal*, says:—

"The remedy has been known by me for years to be effectual, not only with regard to bee stings, but also to the sting of wasps and jumper and greenhead ants. Many years ago, whilst picknicking in a paddock, one of my boys in getting through a fence disturbed a large nest of wasps, and was badly stung on the face, neck, and head. Knowing of the 'wet-earth' cure, I immediately daubed him with mud made with spittle, there being no water handy, and in a very short time he was free from pain. This remedy has been frequently used by myself and boys when stung by jumper and greenhead ants, resulting in almost immediate relief. I think we are too conservative

with regard to simple remedies well known to ourselves, but which may not be known to others; and it would be of great benefit to the public generally were we to make known these *simple remedies.*

"Here is another which may not be generally known:—When stung by a nettle, bruise the leaves and rub them on the part stung; or if by stinging trees—there are two kinds, the large-leaved and the smooth, dark, glossy, green-leaved—cut a piece from the bark and rub the under part with the juice on the place where stung, and great relief will ensue."

We hope that any of our friends in the country who are possessed of like information on this or any other point likely to be of general interest will send it to us for publication.

HEDGE PLANTS.

A correspondent, writing from Apple-tree Creek, Childers, asks for information on the growing of hedges, with a view to beautifying the surroundings of his home. Mr. F. M. Bailey, Government Botanist, says:—

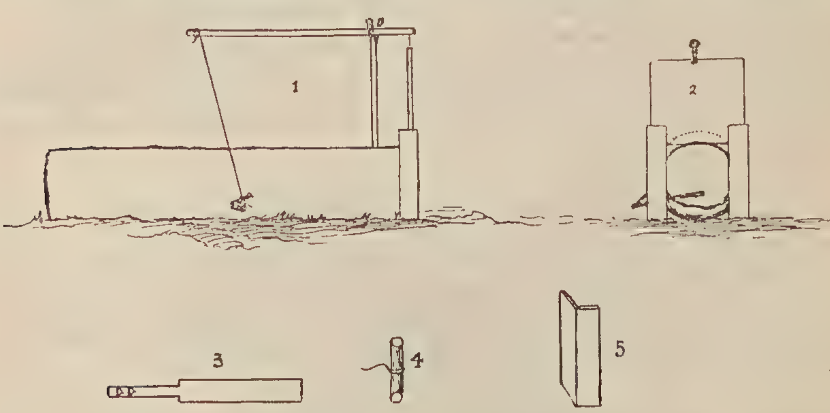
For many reasons I would recommend your correspondent at Apple-tree Creek to grow Duranta (*Duranta Plumieri*) for hedge-making. This plant grows freely from cuttings, forms a dense growth, is seldom eaten by stock, and will make a good hedge 4 to 5 feet high in about three years.

Dig or trench a border 2 feet wide along the line where the hedge is required. If young plants are used, plant them about 15 inches apart and cut down to about 6 inches.

If cuttings, place at about half the distance (6 to 8 inches). These latter should be about 1 foot long and only two buds to be above the ground; see that the soil is pressed close to the base of the cutting. The operation should be performed during damp weather. Failing this, attention must be paid to watering until they have taken hold of the ground.

A GOOD TRAP FOR USE IN FARM OR ORCHARD.

Most farmers and fruit-growers are troubled more or less by kangaroo rats, 'possums, bandicoots, &c., which attack various crops, often doing very serious damage. Various means are used to destroy these pests, and perhaps one of the best of all is the trap of which a sketch is here given. It is both cheap



and effective. Get a nice shell of a hollow log, giving a hollow of about 10 or 12 inches in diameter, and with just enough wood to allow of the necessary working. Cut a length of about 3 feet 6 inches, with the ends cut true. Adze a "cheek" off each side of what is to be the door end, so as to give a good flat nailing face. Then make a couple of grooved sides in which the door is to work up and down. These can be made of pine, according to illustration (No. 5). Nail on the sides of the log so as to have a groove in

front that will carry an inch of timber freely. On top side of log bore a ½-inch hole; this carries the upright forked stick seen in our illustration. This forked stick carries in its turn a light horizontal stick, on front end of which is hung the door, said door being a piece of pine board cut the required length and hung so as to catch the upper edge of log while suspended in the groove.

Now bore another ½-inch hole right into the log pretty low down on one side; next make a treadle like a miniature cricket bat, with two or three notches cut in the handle (Fig. 3), and put this inside the log with the notched handle through the hole, and projecting, say, 1½ inch. Cut a little notch with a knife in the side of the log 1 inch or so above the hole where the treadle projects, taking care to have the flat side of the notch on top to give a catch. Then make a little "trigger," slightly chisel-pointed in the ends, to catch in between a notch in the handle of your treadle and the notch in the log. Take a piece of string of the necessary length, tie one end round the trigger and the other round the back end of the horizontal stick on which the door is hung, and your trap is set. Close in the back end of trap with rather fine wire netting doubled; I say doubled for the reason that I have known kangaroo rats chew a single thickness through, and so squeeze their way out. Bait a few pieces of cut sweet potato or a few grains of maize, just putting one or two on the ground outside, and some more from the entrance right into the trap, and beyond the treadle. Once an animal gets in after the bait he is sure to disturb the treadle, when the trigger is at once freed, and the door slides down, and you have him. With this style of trap I have caught hundreds of animals of various kinds; and the beauty of it is, the log looks so natural and simple that animals are not frightened. After a few animals have been trapped the log gets well "flavoured," and this makes further captures all the easier.

Last summer and autumn I caught nearly thirty kangaroo rats in one of these traps in my own sweet potatoes.

QUEENSLAND AGRICULTURAL COLLEGE.

A NEW science master, Mr. Peter Sutherland, B.A., has been appointed to the Agricultural College, *vice* Mr. H. Schmidt, who lately resigned his appointment. Mr. Sutherland has an excellent record, and should be able to do good service in his new position. A Ballarat man, he attended the Ballarat College, subsequently proceeding to the Melbourne University. He afterwards took his B.A. degree at the Sydney University, and for 7 years followed the teaching profession. For the next 7 years he was employed at the Longerenong College, which was closed at the beginning of 1898, in consequence, it was stated, of a water famine. His last appointment was that of mathematical and science master at Brunswick College. Mr. Sutherland has already taken up his duties at the Gatton College.

WESTERN AUSTRALIAN WHEAT HARVEST.

THE total yield of wheat in Western Australia last harvest has been 857,362 bushels, with an average return of 11·6 bushels per acre. In the previous year the yield reached 408,515 bushels, averaging 10·5 bushels per acre. The present harvest will require to be supplemented for the colony's requirements by 528,388 bushels, or an equivalent in flour.

CATS *V.* RABBITS.

IT is said that the Stock Department of Western Australia has in view the distribution of several hundred cats for the purpose of keeping down the rabbits. The animals will be liberated between Eyre and a point 50 miles west of Israelite Bay. This appears to be rather a doubtful experiment. Cats are not too fond of rabbits, and, even if they did exterminate the rabbits, how are the wild cats to be exterminated afterwards?

EXPORT OF FRUIT.

In the first week of last month the mail steamer "Victoria" left Adelaide with 10,000 cases of apples, of which it is stated that only 30 cases were the produce of South Australia. Weekly mail boats have taken so far, 65,479 cases of apples for the London market, of which 55,696 cases came from Hobart, 7,981 cases from Melbourne, and 1,802 cases only from Adelaide. Commenting on this small export of South Australian apples, the *Adelaide Observer* asks:—

Why should South Australian shipments be considerably less than half the smallest consignment which has been made this year from Tasmania? Some allowance must, of course, be made for the larger production of the island colony, which has been longer at the exporting business, but even on this showing, our fruit is not going away as fast as it ought. It was estimated at the commencement of the season that Tasmania had an exportable surplus of apples for London of about 140,000 cases, while our own surplus was put down at about 14,000 cases, or, say, one-tenth. The weekly shipments, however, do not amount to anything like one-tenth. A large shipment of fruit has just been made from Port Adelaide by the Blue Anchor liner "Narrung," one of a fleet of steamers which have proved themselves eminently adapted for the carriage of fresh fruit, but unfortunately the sailings of these vessels take place at monthly intervals, and it is a great point that our produce should arrive on the London market weekly, if even in somewhat smaller quantities, especially as our competitors are largely represented. Shippers complain of difficulty experienced in securing space, and representatives of steamship lines retaliate that shippers exhibit a lack of confidence in refusing to engage ahead, but presumably the same thing is heard of in the other colonies. The arrival of the "Cuzco," which took the first lot of apples, may be expected in the course of a day or two. Intimation of the opening prices will be awaited with a good deal of interest. During the month of January 303,058 bushels of fresh apples, of a value of £90,514, arrived in the United Kingdom, as compared with 295,551 bushels in 1898 and 280,991 bushels in 1897. During the fortnight which ended February 11, imports came to 178,992 bushels, as compared with 89,252 bushels during the corresponding period of last year. At the time of the last mail leaving London, Californian apples were selling at from 4s. to 9s. per case. The year's consignment of apples have been as follows:—

Boat.	Hobart.	Melbourne.	Adelaide
	Cases.	Cases.	Cases.
Cuzco	9,169	1,110	695
Britannia	8,561	1,470	140
Oruba	5,180	1,691	240
Barbarossa	...	...	75
Oceana	9,009	1,631	122
Ormuz	15,030	750	500
Narrung	...	303	4,154
Victoria	8,647	1,329	30

CARE OF IMPLEMENTS.

At a meeting of the Mount Compass Branch of the Adelaide Bureau of Agriculture, held on 11th March, Mr. R. Cameron read a paper on general farming, and in the course of his remarks he suggested "careful trials of all kinds of manures on rows side by side, say one or two rows with bonedust, one or two with super., and so on. Next year vary the experiment by using nitrate of soda where bonedust was applied, and where super. was put on, try kainit, &c. In this way one could develop the latent fertility of the soil. Each man should keep a full record of all experiments, conditions prevailing at the time; also all costs of seeds, manures applied, bags, tools, time devoted to each crop, &c. In time he would find out where any leaks occurred in the income returns. Implements, bags, and tools cost money, and to save labour is to save money.

Keep everything clean and in order for immediate work. A sharp spade, axe, &c., enables one to do his work quickly and easily, and a little labour spent in cleaning, oiling, painting, housing, &c., will save a lot of expense and trouble. A small workshop, fitted up with a few tools, should be kept by every gardener. A bolt, screw, nail, or rivet put in at the proper time may save a deal in repair later on."

The care of implements, or rather the want of care of them, continues to be one of the blots on many farms in Queensland. Another blot we should like to see wiped out is the bad housing of pigs, and in some cases the utter disregard for the comfort of dairy stock during the winter. In summer we hear of horses dying from sunstroke. At the Queensland Agricultural College, the principal, during the very hot weather of the past summer, had large sheds erected. They were roughly made of bush material, roofed with bushes, over which straw was laid and kept in place by saplings. The horses congregated under these shades, and were thus protected from any danger of sunstroke.

A FINE POTATO PLANT.

A REMARKABLY fine potato plant, says the *Australasian*, grown in the Apollo Bay district, has been shown to us by Messrs. Davis, Lancaster, and Co. It is from a crop grown by Mr. Jas. McPhee, at Heathfield Farm. The area of the paddock is 5 acres; but the yield is expected to reach 75 tons, or an average of 15 tons per acre. The soil is 20 feet deep, with a clay bottom, and the ground forms part of the river flats, of which there is a considerable quantity. The haulm of the plants exhibits unusual vigour of growth, the one shown to us, laid out on a board, reaching the length of 9 feet. From its roots twelve large potatoes were taken. The variety is the New Zealand Blue Derwent. The Apollo Bay district also produces good crops of onions, yields of 30 tons per acre being common.

A STORY WITH A MORAL.

IT is not our province to supply our readers with amusing stories. Our work is to disseminate interesting and useful information applicable to rural pursuits. As, however, the following little story carries with it an obvious application, we give it as it was related by the Hon. J. V. Chataway at the late anniversary meeting of the Chamber of Commerce in Brisbane:—

"Two frogs fell into a dish of milk. One of the frogs was of the despairing helpless kind. He battled for some time, and then coming to the conclusion that the fates were against him, he gave up the struggle and the ghost at the same time. The other frog was a more optimistic individual. He had no idea of giving in so long as he could make a fight for existence. He therefore struck out briskly, and kept going so long that at last he found himself landed high and dry on a pat of butter. He had worked or rather churned out his own salvation."

The moral of this story lieth in the application thereof. Many a man engaged in farming or other rural pursuits gets on all right till difficulties occur, and then losing heart he gives up the struggle and goes down, whilst other men never give in whilst there is the slightest chance of pulling things round. Such men usually find themselves safely landed on the pat of butter.

THE BITE OF A PIG.

WHILST the fangs of some snakes and of a large number of insects carry venom into the wound inflicted by them, there is no true venom in the teeth of any quadruped, not even in those of a dog afflicted with rabies. The poison in the case of bites from dogs, cats, monkeys, pigs, &c., is conveyed by means of the saliva, and the more unclean feeder an animal is, the greater will be the danger of blood-poisoning after a bite from such an animal. The pig is one of the uncleanest feeders amongst mammals, and the animal's saliva is consequently dangerous if injected into the human body. When a pig is

enraged, the flow of saliva increases, and should it bite a person when in an excited condition, the danger is increased. In all cases of a bite being inflicted by any animal, but more especially by the pig, the wound should be at once washed in very dilute carbolic acid (one part acid to 2,000 parts water), for if unattended to, there is the greatest danger of blood-poisoning supervening, possibly with very grave results.

PURE WATER AS A POISON.

The *American Druggist* says that Dr. H. Koeppe has made a very interesting communication to a recent number of the *Deutsche Medicinische Wochenschrift* (1898-624), upon the subject of pure water, and has arrived at the conclusion that absolutely pure water is a poison, a sentiment long since adopted in Kentucky.

Isolated living elements, and single-celled organisms die in distilled water, since this deprives the cells by osmosis (the tendency of fluids to mix) of the salts which are essential to life.

The epithelial cells of the stomach are destroyed by free ingestion of distilled water, and are eventually thrown off. This local poisoning is indicated by the nausea and vomiting which follow the ingestion of distilled water.

In support of this singular view, Dr. Koeppe cites the fact that the very pure water which results from the melting of glaciers and of snow upon mountains is very unwholesome. Another link in the chain of evidence is the fact that a certain spring, known for hundreds of years as the "poison spring," yields water which, on chemical analysis, appears to be absolutely pure.

The above statement of Dr. Koeppe would appear to be further strengthened by a late discovery of a method of dissolving gold (hitherto only soluble in a mixture of two acids) in distilled water.—Ed. *Q.A.J.*

THE GOURAMI.

A correspondent of the *Tropical Agriculturist*, Colombo, writes from the Seychelles, concerning this fish (which it will be remembered was lately introduced into this colony by Mr. D. O'Connor, of Oxley) :—

"A day or two ago a new arrival from Ceylon showed me an article on the *gourami fish*, that appeared in the *Tropical Agriculturist* for December last. I note also that an attempt is being made to introduce this fish into your island.

"In Seychelles the gourami was formerly very common. Owing probably to its excellence, when cooked, nearly all the easily accessible ponds have been netted and the fish captured.

"The B.I. s.s. "Lawada" goes direct from here to Colombo: so I hoped to have been able to have sent a few specimens of the gourami to you by her. A pond, said to contain gourami, has just been drawn blank, and there is now hardly time for me to send to other ponds before the steamer's departure. I hope, however, to be more successful shortly, and to send you some good specimens before long.

"I doubt very much if the gourami will thrive in the hills in Ceylon. Even here in Seychelles, where our highest mountains are under 3,000 feet, the gourami do far better near the sea-level.

"There is a kind of dock-leaf plant always found growing near gourami ponds. The owners occasionally throw in a few leaves, which are eagerly devoured by the fish. It is said by some that gourami will not thrive without an occasional feed of this leaf. Be that true or not, I take the precaution of now sending you by the "Lawada" a few plants, that they may be ready for the fish when they arrive later on. They ought to be planted out in rather damp soil."

We have no information concerning the gourami brought to Queensland. If they are living, it might be well to import seeds or roots of the dock plant mentioned.—Ed. *Q.A.J.*

The Markets.

AVERAGE PRICES FOR MARCH.

Article.		March. Top Prices. £ s. d.
Bacon	lb.	0 0 7
Bran	ton	4 5 0
Butter, First	lb.	0 0 9⅖
Butter, Second	,,	0 0 5¾
Chaff, Mixed	ton	3 12 0
Chaff, Oaten	,,	4 8 0
Chaff, Lucerne	,,	3 10 0
Chaff, Wheaten	,,	3 0 0
Cheese	lb.	0 0 6¾
Flour	ton	8 0 0
Hay, Oaten	,,	3 10 0
Hay, Lucerne	,,	2 18 6
Honey	lb.	0 0 2
Japanese Rice, Bond	ton	13 10 0
Maize	bush.	0 4 1⅘
Oats	,,	0 3 6
Pollard	ton	4 10 0
Potatoes	,,	5 11 0
Potatoes, Sweet	,,	3 5 0
Pumpkins, Table	,,	4 0 0
Sugar, White	,,	14 10 0
Sugar, Yellow	,,	11 15 0
Sugar, Ration	,,	9 0 0
Wheat	bush.	0 3 6
Onions	cwt.	0 5 6
Hams	lb.	0 0 9⅗
Eggs	doz.	0 1 2
Fowls	pair	0 3 9⅗
Geese	,,	0 4 11⅖
Ducks, English	,,	0 2 11
Ducks, Muscovy	,,	0 4 9
Turkeys, Hens	,,	0 5 9⅗
Turkeys, Gobblers	,,	0 12 8⅖

ENOGGERA SALES.

Article.	March. Top Prices. £ s. d.
Bullocks	5 3 9
Cows	3 2 0
Wethers, Merino	0 9 9¾
Ewes, Merino	0 6 6
Wethers, C.B.	0 11 5¼
Ewes, C.B.	0 8 11
Lambs	0 9 2¼
Pigs	...
Baconers	1 18 0
Porkers	1 7 0
Slips	0 11 6

Orchard Notes for May.

By ALBERT H. BENSON.

The hints given in last month's notes on the gathering, handling, and marketing of citrus fruits apply equally to the present month, with this difference, however, that even more care is required, as the riper citrus fruits become, the more readily are they bruised and injured. May being usually a more or less dry month on the coast, the opportunity should be taken of cleaning up all weeds and rubbish that may have accumulated during the summer and autumn, and getting the surface of the land into a good state of cultivation, so that the comparatively small rainfall of the winter months may be conserved in the soil for the trees' growth. Unless this is done, fruit trees, especially citrus, are apt to suffer, especially if growing on shallow or badly drained soil with a retentive subsoil. Where not already done, all dead or worthless trees should be dug out; and if fresh trees are to be planted in the same place, then the holes from which the trees have been taken should be allowed to remain open, and the soil should be well exposed to the action of the atmosphere and be well sweetened. Land intended for planting during the winter should be got ready, more especially if it is new land, as it is a mistake to delay the preparation of the land too much, or to plant the trees in raw, unsweetened, and improperly prepared land. What planting has to be done, see that it is done well, as an acre of land properly prepared will pay better than twice or three times that quantity treated anyhow.

Towards the end of the month slowly soluble manures, such as boiling-down refuse or coarse bones, may be applied to the land, as they will become slowly available; and when the spring growth starts, they trees will get the benefit. Quickly soluble manure should not be applied now, but should only be used during a a period of active plant growth, otherwise they are apt to be lost. Where possible, don't destroy the weeds and refuse of an orchard unless the same is diseased, or is likely to form a bad harbour for injurious insects, but rather form it into a compost heap, preferably with lime, and allow it to become well rotten, when it will be found to be a valuable mulch for citrus and other trees in many soils; as though our soils, as a rule, are great producers of weeds, many are actually deficient in vegetable matter, so that it is a mistake to burn off all weeds, grass, or other rubbish. This deficiency of organic matter in the soil is a serious consideration, as soils deficient in organic matter are usually deficient in nitrogen, and also they are deficient in the power to retain moisture—a matter of extreme importance in a country like this, where we are subject to such long spells of dry weather.

In the colder districts the pruning of deciduous trees may be commenced towards the end of the month, but in other parts of the colony it is better to wait longer, as the leaves are not off and the sap is not down. In the case of grapes, early pruning is always to be advocated where possible, as it is best to prune as soon as ever the sap is down. Pineapples, where at all subject to frost, should receive a light covering of grass or other similar material as a protection or, where practicable, as in the case of scrub lands subject to slight frosts, they should be covered with a light framework covered with palm leaves or similar material.

Palm stems or saplings resting on forked posts, placed on either side of the bed to be protected, make a good framework; and with palm-leaves, tea-tree bush, or other similar material laid across from sapling to sapling, a very cheap and efficient protection against frost is obtained.

Gather and destroy all infested guavas, oranges, custard apple, &c., so as to destroy the larvæ of any fruit flies or moths that may be in them, as if these insects are well killed down now there will be many less to deal with next spring, and there is a chance of the earlier fruits being harvested without much loss.

Inspect all citrus and other fruit trees carefully, especially those in new districts; and where scale insects or other diseases are found, stamp them out before they get a complete hold of the orchard, as trees can be easily and cheaply cleaned if taken in time, that will be both difficult and expensive to clean if neglected.

Farm and Garden Notes for May.

Farm.—Ploughing and making ready for sowing cereals should be proceeded with at once, and if sowings have not yet been made, no time should be lost in getting in all kinds of pasture grasses, wheat, barley, oats, rye, vetches, and lucerne. The potatoes should now all be hilled up. Where cotton is grown, the pods will now be bursting freely, and the bushes should be stripped daily after the dew has evaporated. Cotton should never be picked in a wet condition. After picking spread it out on tables to dry before housing. Tobacco cutting may be continued, beginning with the lower leaves and taking off the upper ones as they ripen. Prepare for winter feeding of stock by chaffing all kinds of greenstuff into the silo. Where no silo building exists stacks may be made.

Coffee gathering must be prosecuted with vigour. Attend to bananas, and cut the bunches as they mature. Strawberries may now be transplanted. Trollope's Victoria, Marguerite, and Hautbois are good varieties. The Marguerites are early and good bearers. Six thousand plants are required to plant an acre. In some localities strawberry planting is concluded in March, when the plants begin to bear in the first week in August.

Kitchen Garden.—Onions which have been grown in seedbeds may now be planted, care being taken to have the ground thoroughly cleaned and pulverised beforehand. Onions may also still be sown in the open ground, but the ground *must* be clean to ensure any measure of success. Take advantage of favourable weather to plant out cabbage, lettuce, leeks, &c., and, in fact, anything which requires planting. The following seeds may be sown—viz.: Peas, broad beans, cabbage, kohl rabi, lettuce, leeks, radishes, spinach, turnips, beet, parsnips and carrots. If any asparagus or rhubarb is to be planted the ground for them should now be prepared by trenching or subsoiling, and well manuring. [Full instructions for asparagus growing are given in the *Journal* (vol. ii. page 322) and in the number for March, 1899, p. 159.]

Flower Garden.—Should the present showery weather continue, both planting and transplanting may be done at once, as the plants will be established before the frosts set in. Camellias, gardenias, &c., may be safely transplanted, and such soft-wooded plants as verbenas, petunias, penstemons, &c. Cut back and prune all trees and shrubs ready for digging. Take up dahlia roots, and plant bulbs such as hyacinth, tulips, anemones, ranunculus, snowflakes, freesias, ixias, iris, narcissus, &c. As the weather is now sensibly cooler, all shades and screens may be removed to enable the plants to get the full benefit of the air. Fork in the mulching and keep the hoe going in the walks. Clip edgings and hedges.

Public Announcements.

The Editor will be glad to receive any papers of special merit which may be read at meetings of Agricultural and Pastoral Associations in Queensland, reserving, however, the right to decide whether their value and importance will justify their publication.

We shall be pleased to receive reports of the progress of Butter and Cheese Factories and Creameries for publication.

The *Queensland Agricultural Journal* will be supplied to all members of Agricultural and Horticultural Societies who do not derive their livelihood solely from the land, on payment, in advance, of an annual subscription of 5s.

GOVERNMENT AGRICULTURAL LABORATORY.

INSTRUCTION FOR THE COLLECTION OF SAMPLES, AND SCALE OF FEES.

GENERAL INSTRUCTIONS.

1. All analyses are carried out in their turn as they arrive at the Laboratory.

2. Should a customer wish for an immediate analysis, the fee, as provided by scale of fees below, will be increased by 50 per cent.

3. The samples may be forwarded by parcel post or by rail, either to the Under Secretary for Agriculture, Brisbane, or direct to the Chemist, Agricultural Laboratory, at the Agricultural College, Gatton; but in any case the required fee must be transmitted at the same time.

4. Analyses will be only carried out, if samples are taken strictly in accordance with the instructions issued below.

SCALE OF FEES.

	Farmers, Selectors, Gardeners. £	s.	d.
Soil—Short analysis (estimation of lime, alkalies, nitrogen, and phosphoric acid)	2	2	0
Soil and Subsoil—Short analysis	3	3	0
Soil—Complete analysis	4	4	0
Water—Analysis	3	3	0
Manures—			
Complete analysis	2	2	0
Nitrogen only	0	7	6
Potash only	0	7	6
Phosphoric acid sol.	0	15	0
Phosphoric acid insol.	0	15	0
Food Stuffs—			
Complete analysis	2	2	0
Water only	0	5	0
Albuminoids	0	10	0
Oil or fat	0	7	6
Ash	0	5	0
Fibre	0	7	6
Sugar-cane, sugar-beet, megass—Analysis of	1	1	0
Sugar, massecuite, jelly, molasses	1	1	0
Milk, butter, cheese—Complete analysis	1	0	0
Tanning materials (tannin estim.)	1	0	0
Soaps	1	10	0
Limestone, cement, clay, &c....	3	0	0

INSTRUCTIONS FOR TAKING AND COLLECTING OF SAMPLES.

SOILS AND SUBSOILS.

To obtain a fair average sample of the soil of a block of land, as near as possible, equal quantities of soil are taken from various parts of the fields.

A sketch plan of the field, paddock, or block of land on which the samples were taken should accompany the samples, and the spots where samples are taken are marked on this plan and numbered. This sketch plan should also indicate position of roads, creeks, gullies, ridges, general fall of the land, &c.

Should the soil in various parts of the block show a very marked difference, it will be necessary to divide the block into two, rarely in more, parts. Should the different soil occur only in a small patch, this sample may be left out.

Not less than three samples should be taken in each section. A greater number is to be preferred, as a better average will be obtained.

At the places chosen for the taking of the samples the surface is slightly scraped with a sharp tool, to remove any surface vegetation which has not as yet become part of the soil.

Vertical holes from 10 to 18 inches square are dug in the ground to a depth of 2 feet 6 inches to 3 feet.

The holes are dug out like post-holes; an earth-auger facilitates the operation considerably, and the holes may be trimmed with the spade afterwards.

Careful note of the appearance of the freshly cut soil and subsoil should be taken. The depth of the real soil, which in most cases is easily distinguished, is also measured and noted for each hole. Note how deep the roots of the surface vegetation reach into the soil. If the soil changes gradually into the subsoil, as is the case in some places where the soil is of very great depth, this line of division is guessed approximately, or it is best to take the soil uniformly to a depth of 12 inches.

With a spade a slice of soil is now cut off and put on to a clean bag. The same is done with the subsoil, and the slice is taken from where the soil ends (or 12 inches) to the bottom of the hole, and this subsoil placed on another bag. Stones over the size of a pea may be picked out, the rough quantity of such stones estimated, and a few enclosed with the samples. Fine roots must not be taken out from the soil samples. The same operation is repeated at the other places chosen. Careful note and description in each hole, as numbered and marked on plan given, and the samples of soil collected on the one bag thoroughly mixed by breaking up any large clods, and about 10 lb. of the mixture put into a clean canvas bag, which is securely tied up and labelled. The same is done with the samples of subsoil collected on the other bag.

All the samples collected are afterwards placed into a wooden box.

It is important to use clean bags and clean boxes, and also that the samples should not be left in the neighbourhood of stables or manure heaps. A short description of the land must accompany the samples and the sketch plan.

In the case of cultivated land, state how long the land was under cultivation, what crops were chiefly grown, result of such crops, was any manure applied, when, and what sort, and in what quantities per acre. In the case of virgin soil, state if the land was heavily timbered or not, ringbarked, if scrub or forest land, what sort of timber was chiefly growing on the land. In all cases a description of the neighbouring land, outcropping rocks, &c., are of great value. Also state if the land is naturally or artificially drained or not; describe the land as regards its position to hills, roads, creeks, ridges, &c. Only by adhering strictly to these instructions, and by giving minute details, benefit can be derived from the soil analyses.

WATER.

It is best to collect and forward samples of water for analysis in stoppered glass bottles, generally known as Winchester quarts.

The bottles have to be perfectly clean, and stoppers must fit well. Corks should be avoided, but if used must be new and well washed with the water before being used for closing the bottle.

When taking waters from taps, pumps, bores, the water has to be allowed to run for a while before taking the sample. When taking the water out of a well, pond, or river, the bottle is completely immersed, but care has to be taken not to disturb the mud or sediment at the bottom of the water. Before the sample is actually collected, the bottle is rinsed three times with the water, filling each time about one-third full. The bottle is then filled within about 1 inch from the top; the stopper is inserted and securely tied down with a clean piece of linen or calico.

The stopper must not be fastened or luted with sealing-wax, paste, plaster of paris, &c.

MANURES.

When taking samples of artificial manures out of bags, the sample must be taken from different bags and at different places of the bag and not only from the top, or the bags before being used are emptied on a heap and mixed up well and the sample then taken. About 1 to 2 lb. put into a clean bag should be forwarded for analysis.

FOOD STUFFS.

It is always important to obtain good average samples, and this can only be done by great care in taking the samples from different places, mixing well, and taking a small part of the mixture. This method would apply to any dry food-stuff—as grains of any kind, peas, beans, chaff, pollard, meal, &c. For the analysis of green foods—as green hay, sorghum, silage—it is best to make a mixture of the sample by passing it through a chaffcutter, and by taking an accurately weighed quantity—say 1 lb. This quantity may then be dried in the sun, taking care that nothing is lost, and when dry put in a bag and forwarded for analysis. The green samples may also be forwarded without drying in fruit-preserving jars.

To collect information about value of *green manures*, it is best to plot out exactly one square yard in the field covered with the plant, not picking out a position where the growth is very heavy or poor, but about a fair average. Four pegs are driven into the ground at the four corners, and string stretched between them; with a sharp spade all the plants are cut along the strings, so as to get really the growth of one square yard. The plants are all collected and accurately weighed, passed through a chaffcutter, and the sample for analysis taken as above described. In many cases the roots may be also pulled out, weighed separately, and a sample forwarded.

The samples have to be accompanied by a description of the crop—when planted, how old when cut, if the land was manured or not, weight of crop per acre or per square yard, and weight of the sample forwarded when in its green state. In the case of green manures it is generally best to take the samples at the same time when ploughed under, just after flowering.

"THE DISEASES IN PLANTS ACT OF 1896."

Department of Agriculture,
Brisbane, 19th January, 1899.

HIS Excellency the Governor, with the advice of the Executive Council, and in pursuance of the provisions of "*The Diseases in Plants Act of* 1896," has been pleased to make the following further Regulations.

J. V. CHATAWAY.

THE FUMIGATION OF FRUIT FOR EXPORT.

1. Any one who wishes to erect a chamber or building for the fumigating of fruit is requested to give notice to the Under Secretary for Agriculture, who will take steps to see that the chamber or building is properly constructed.

2. When it is required to fumigate fruit for export, twenty-four hours' notice must be given to the said Under Secretary or such other officer as may be duly authorised to accept such notice.

3. The operation of fumigating must be conducted under the control of an officer authorised by the Minister for Agriculture.

4. The fumigating chamber may be made of any convenient size or material, the essential point being that it shall be capable of being closed absolutely airtight, and provided with a flue-pipe in the roof which can be opened or closed to allow of the escape of the gas after fumigation. The flue must be provided with a box or chamber to contain caustic soda or potash to destroy the gas.

The fumigating chamber must be provided with a shutter or sliding panel in the lower portion of the door or wall.

Door, flue, and shutter must all be made to close absolutely airtight.

Directions for Fumigating with Hydrocyanic Acid Gas.

Proportions of Ingredients.—For every 150 cubic feet of room take 1 ounce of cyanide of potassium, 5 fluid ounces sulphuric acid, 10 fluid ounces water.

Having placed the fruit to be fumigated in the chamber, see that the flue and the shutter in the door or lower part of all are properly closed.

The acid is then to be diluted in the following manner:—The whole of the water is placed in a shallow china or glazed earthenware vessel, such as an ordinary wash-hand basin. (Metal vessels are inadvisable unless they are leaden ones.) The sulphuric acid is next poured on to the water in a thin stream, stirring the while with a stick. Do not mix by adding the water to the acid.

The basin containing the acid thus diluted (which should be allowed to cool) is now placed in the fumigating chamber, and the cyanide of potassium is emptied into it.

The gas is given off with great violence, and the door should be immediately closed.

The whole is now to be left to itself for one hour. At the end of this time the shutters in the flue and in the door are opened, and the draught produced drives the gas out of the chamber. At the end of half an hour the door is thrown open, and if the draught has been effective there should be hardly any trace of hydrocyanic gas recognisable. The chamber may be left in this condition for another ten minutes or a quarter of an hour. The fruit is now to be moved and allowed to remain in a well ventilated place, preferably out of doors, for another half an hour. Samples of fruit will be examined from time to time by the entomologist.

Caution.—As hydrocyanic acid gas is most deadly in its effects on animal life, the greatest care must be taken in its use.

Department of Agriculture,
Brisbane, , 18 .

This is to certify that has treated cases of citrus fruit with hydrocyanic acid gas for one hour, under my supervision. These cases have been branded "Crown" over "Passed."

Shipping marks:
Per S.S.:
Consigned to:

Department of Agriculture,
Brisbane, 26th January, 1899.

THE following Proclamation by His Excellency the Governor of New South Wales is published for general information.

J. V. CHATAWAY.

Proclamation.

New South Wales, to wit.
(L.S.)
Hampden,
Governor.

By His Excellency The Right Honourable Henry Robert, Viscount Hampden, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

Whereas the Governor is empowered by Section 9 of the "Vegetation Diseases Act, 1897," from time to time, by Proclamation in the *Gazette*, to declare any fungus or vegetable parasite whatever to be a fungus within the meaning of the said Act: Now, therefore, I, Henry Robert, Viscount Hampden, the Governor aforesaid, with the advice of the Executive Council, do, by this my Proclamation, declare Black Spot (*Fusicladium*) to be a fungus within the meaning of the said Act.

Given under my Hand and Seal, at Government House, Sydney, this twenty-second day of December, in the year of our Lord one thousand eight hundred and ninety-eight, and in the sixty-second year of Her Majesty's reign.

By His Excellency's Command,

JOSEPH COOK.

God Save the Queen!

LIST OF AGRICULTURAL, HORTICULTURAL, AND PASTORAL SOCIETIES AND ASSOCIATIONS IN QUEENSLAND.

Postal Address.	Name of Society.	Name of Secretary.	Date of Show.
Allora ...	Central Downs Agricultural and Horticultural Association	J. H. Buxton... ...	
Avondale ...	Avondale Farmers' and Planters' Association	N. J. Mikkelsen ...	
Ayr	Lower Burdekin Farmers' Association ...	Winsor H. Wilmington	
Beaudesert ...	Logan and Albert Pastoral and Agricultural Society	M. Hinchcliffe ...	23 June
Beenleigh ...	Agricultural and Pastoral Society of Southern Queensland	Wilson Holliday ...	15 Sept.
Biggenden ...	Biggenden Agricultural and Pastoral Society	Charles H. Peppin ...	29 June
Birthamba ...	South Kolan Agricultural and General Progress Association	G. W. Nixon ...	
Blackall ...	Barcoo Pastoral Society	F. Clewett	
Boonah ...	Fassifern and Dugandan Agricultural and Pastoral Association	J. A. McBean ...	18 and 19 May
Bowen ...	Pastoral, Agricultural, and Mining Society ...	J. E. Smith	8 June
Bowen ...	Preston Farmers' Association	R. A. Foulger ...	
Bowen ...	Proserpine Farmers' and Settlers' Association	G. W. Pott	
Brisbane ...	Horticultural Society of Queensland	J. F. Bailey	— Oct.
Brisbane ...	Moreton Agricultural, Horticultural, and Industrial Association	J. Duffield	
Brisbane ...	Queensland Acclimatisation Society	E. Grimley	
Brisbane ..	Queensland Fruit and Economic Plant Growers' Association	G. K. Seabrook ...	
Brisbane ...	National Agricultural and Industrial Association of Queensland	H. C. Wood	10, 11, and 12 Aug.
Brisbane ...	Queensland Stockbreeders' and Graziers' Association	F. A. Blackman ..	
Brisbane ...	United Pastoralists' Association	Fredk. Ranson ..	
Bundaberg ...	Bundaberg Agricultural and Pastoral Society	A. McIntosh... ..	12, 13, and 14 Oct.
Bundaberg ...	Bundaberg Horticultural and Industrial Society	H. E. Ashley... ...	
Bundaberg ...	Woongarra Canegrowers' and Farmers' Association	H. Cattermull ...	
Burpengary...	Burpengary Farmers' Association	C. H. Ham	
Caboolture ...	Caboolture Farmers' Association	G. Mallet	
Cairns ..	Barron Valley Farmers' and Progress Association	W. F. Logan... ...	
Cairns ...	Cairns Agricultural, Pastoral, and Mining Association	A. J. Draper... ...	28 and 29 Sept.
Cairns ...	Hambledon Planters' Association	E. Whitehouse ...	
Charleville ..	Centra Warrego Pastoral and Agricultural Association	A. J. Carter	25 and 26 May
Charters Towers	Towers Pastoral, Agricultural, and Mining Association	W. Tilley	
Childers ...	Isis Agricultural Association	H. Epps	
Childers ...	Childers Progress Branch, Isis Agricultural Association	N. Rosenlund ...	
Childers ...	Doolbi Mill Branch, Isis Agricultural Association	W. T. H. Job ...	
Childers ...	Childers Mill Branch, Isis Agricultural Association	H. Epps	
Clermont ...	Peak Downs Pastoral, Horticultural, and Agricultural Society	F. Leysley	
Clermont ...	Peak Downs Dairymen and Settlers' Association	A. G. Pursell ...	
Cooktown ...	Cook District Pastoral and Agricultural Society	W. R. Humphreys ...	
Cordalba ...	Cordalba Farmers' Association	B. Goodliffe	
Currajong ...	Currajong Farmers' Progress Association ...	Wm. Howard ...	
Cunnamulla	South Warrego Pastoral Association	J. Winward	
Degilbo ...	Degilbo Farmers' Progress Association ...	F. A. Griffiths ...	22 and 23 June
Gayndah ...	Gayndah Agricultural and Horticultural Association	J. C. Kerr	
Gayndah ...	Mungore Farmers' Association...	J. M. Robinson ...	

AGRICULTURAL AND HORTICULTURAL SOCIETIES—*continued.*

Postal Address.	Name of Society.	Name of Secretary.	Date of Show.
Gin Gin ...	Pastoral and Agricultural Society of Gin Gin	E. K. Wollen ...	
Gladstone ...	Gladstone Pastoral and Agricultural Association	W. J. Manning ...	
Gooburrum, Bundaberg	Gooburrum Farmers' and Canegrowers' Association	W. J. Tutin	
Goondiwindi	MacIntyre River Pastoral and Agricultural Society	A. Gough	
Gympie ...	Agricultural, Mining, and Pastoral Society	F. Vaughan	14 and 15 Sept.
Gympie ...	Gympie Horticultural Society	W. G. Ambrose ...	
Halifax ...	Herbert River Farmers' League	Alfred Henry ...	
Helidon ...	Helidon Scrub Farmers' Progress Association	M. Morgan	
Herbert River	Halifax Planters' Club	H. G. Faithful ...	
Herbert River	Macnade Farmers' Association...	E. C. Biggs	
Herbert River	Ripple Creek Farmers' Association	J. W. Grimes ...	
Herberton ...	Mining, Pastoral, and Agricultural Association	John M. Hollway ...	3 and 4 April
Hughenden ...	Hughenden Pastoral and Agricultural Association	W. H. Mulligan ...	8 and 9 May
Ingham ...	Herbert River Farmers' Association	...	
Ingham ...	Herbert River Pastoral and Agricultural Association	P. S. Cochrane ...	3 Sept.
Ipswich ..	Ipswich and West Moreton Agricultural and Horticultural Society	P. W. Cameron ...	6 Oct.
Ipswich ...	Queensland Pastoral and Agricultural Society	Elias Harding ...	1 and 2 June
Kandanga (near Gympie)	Kandanga Farmers' Association	N. Rasmussen ...	
Kolan ...	Kolan Canegrowers' and Farmers' Association	C. Marks	
Laidley ...	Lockyer Agricultural and Industrial Society	John Fielding ...	26 and 27 July
Loganholme...	Logan Farming and Industrial Association ...	F. W. Peek	
Longreach ...	Longreach Pastoral and Agricultural Society	J. P. Peterson ...	12 April
Lucinda Point	Victoria Farmers' Association	W. S. C. Warren ...	
Mackay ...	Agricultural, Pastoral, and Mining Association	F. Black	
Mackay ...	Pioneer River Farmers' Association	E. Swayne	28 and 29 June
Maryborough	Maryborough Horticultural Society	H. A. Jones	
Maryborough	Wide Bay and Burnett Pastoral and Agricultural Society	G. Willey	5, 6, and 7 July
Miallo ...	Miallo Progress Association	E. F. Welchman ...	
Milbong ...	Milbong Farmers' Association	T. R. Garrick ...	
Mitchell ...	Mitchell and Maranoa Pastoral, Agricultural, and Vinegrowers' Association	H. J. Corbett ...	
Mosman River	Mosman River Farmers' Association	...	
Mount Mee...	Mount Mee Farmers' Association	R. Thomas	
Mount Morgan	Mount Morgan Mining, Agricultural, Poultry, Pastoral, and Horticultural Society	G. Orford	
Mount Morgan	Mount Morgan Agricultural, Pastoral, and Poultry Society	Thos. W. Walker ...	
Mulgrave ...	Mulgrave River Farmers' Association ...	Thos. Swan	
Nerang ...	South Queensland and Border Pastoral and Agricultural Society	W. J. Browne ...	
North Isis ...	North Isis Canegrowers' Association	W. J. Young ...	
Pialba ...	Pialba Farmers' Association	J. B. Stephens ...	
Pinbarren ...	Pinbarren Agricultural and Progress Association	H. Armitage, senr. ...	
Rockhampton	Central Queensland Farmers' and Selectors' Association	T. Whitely, Coowonga	
Rockhampton	Central Queensland Pastoral Employers' Association	G. Mackay	

AGRICULTURAL AND HORTICULTURAL SOCIETIES—*continued.*

Postal Address.	Name of Society.	Name of Secretary.	Date of Show.
Rockhampton	Central Queensland Stockowners' Association	R. R. Dawbarn ...	
Rockhampton	Rockhampton Agricultural Society	R. R. Dawbarn ...	10 and 11 May
Roma ...	Western Queensland Pastoral and Agricultural Association	H. K. Alford ...	25 and 26 July
Roma ...	Yingerbay Farmers' Association	F. E. Glazier... ...	
Rosewood ...	Farmers' Club	P. H. Adams... ...	25 Aug.
Springsure ...	Queensland Pastoral Society	G. R. Milliken ...	
Stanthorpe ...	Border Agricultural, Pastoral, and Mining Society	Geo. Simcocks ...	
Stanthorpe ...	Stanthorpe Horticultural and Viticultural Society	R. Hoggan	
St. George ...	Balonne Pastoral and Agricultural Association	T. M. Cummings ...	
Tinana ...	Tinana Fruitgrowers' and Farmers' Association	Chas. Parke	
Toowoomba	Darling Downs Horticultural Association ...	H. Hopkins	
Toowoomba	Drayton and Toowoomba Agricultural and Horticultural Society	H. Symes	
Toowoomba	Royal Agricultural Society of Queensland ...	F. Burtt	2, 3, and 4 Aug.
Townsville ...	Townsville Pastoral, Agricultural, and Industrial Association (formerly North Queensland Pastoral and Agricultural Association)	J. N. Parkes	
Wallumbilla	Wallumbilla Farmers' Association	P. W. Howse ...	
Warwick ...	Eastern Downs Horticultural and Agricultural Association	J. Selke	
Wellington Point	Wellington Point Agricultural, Horticultural, and Industrial Association	F. W. Wort	21 June
Woombye ...	Woombye Fruitgrowers' Association	P. S. Hungerford ...	
Woowoonga	Woowoonga Scrub Farmers' Association ...	H. B. Griffiths ...	

BURSARIES.—JUNE EXAMINATIONS.

Department of Agriculture,
Brisbane, 25th April, 1899.

BURSARIES, QUEENSLAND AGRICULTURAL COLLEGE.

An examination will be held on the 17th June next in Brisbane and elsewhere, as may be decided upon, according to the localities in which the candidates reside, for 4 bursaries at the Queensland Agricultural College. These entitle the holders to free board and instruction as resident students, and are tenable during good behaviour for 3 years. Candidates must be not less than 16 nor more than 18 years of age on the 30th June, 1899.

Applications for examination must reach the Under Secretary for Agriculture not later than the 15th May next, and must be accompanied by (1) a certificate of birth; (2) that the applicant has resided for two years in Queensland, or that his parents have resided here for three years preceding the examinations—this certificate to be attested by a magistrate; (3) a medical certificate that he is of sound constitution and in good health.

The examination will cover the following subjects:—Reading, writing, arithmetic, English composition, geography, optional subjects, elements of agriculture.

Further particulars on application to the Under Secretary.

J. V. CHATAWAY.

By Authority: Edmund Gregory, Government Printer, William street Brisbane.

Agriculture.

MARKET GARDENING.

ROOT CROPS.

CARROTS.

The carrot (*Daucus Carota*) is a biennial plant indigenous to Europe, and is said by some authorities to have been derived from the common wild carrot, while others maintain that it has originated from a distinct species.

The best crops of carrots are grown on rich sandy soil which has been heavily manured for a previous crop. Soil treated with rank new manure will not grow good carrots, as they invariably grow coarse and flavourless if the manure is too new.

The soil should, therefore, if it requires enriching, have the manure applied some time previous to sowing the seed, and it ought also to be ploughed deeply to enable the roots to grow long and straight.

If the ground is hard underneath, the carrots will fork out, and perhaps growth may take place from the sides of the roots instead of continuing straight downwards.

A good time to sow the main crop of carrots here is in March or April, although with a little care they may be grown all the year round. The soil should be made as fine as possible before sowing the seed, because carrot seed is of a very perishable nature, and the finer the soil is the better is the prospect of its germinating well.

The drills may be from 16 inches to 3 feet apart, the latter distance being preferable where plenty of land is available, because the greater interval between the rows will make the work of cleaning and cultivating much easier, enabling most of it to be carried on by means of horse implements.

The drills should not be more than 1 inch or $1\frac{1}{2}$ inches deep, and after sowing and covering in the drills a light roller should be passed over the ground to break all the lumps in the soil, and also to assist the seed to germinate. When the plants are a few inches high, they must be thinned out to from 3 to 6 inches apart, and after that, the only requirement of the crop is that the ground be kept well stirred and free from weeds.

Carrots should be fit for use in from 80 to 100 days after sowing.

There are two distinct types of carrots grown for table use—the Short Horn and the Intermediate. The former comes to maturity early, and is perhaps the best for small gardens; but for growing on a large scale, the longer varieties are the more profitable.

PARSNIPS.

The parsnip (*Pencedanum sativam*) is a hardy biennial plant, and is a native of Great Britain, Central and Southern Europe.

Its culture is easy, being precisely the same as that of the carrot; depth of soil, however, being of primary importance. The ground must either be trenched or ploughed very deeply to obtain good crops of parsnips.

The seed may be sown in March or April for the main crop in drills from 2 to 3 feet apart, the plants being subsequently thinned out to 8 or 9 inches.

They should be ready for use in about 100 days after germinating.

Besides being an excellent table vegetable, parsnips are largely used for stock in cold countries, and are considered a valuable winter food.

TURNIPS.

The turnip (*Brassica rapa*) is a hardy biennial, a native of Europe, and has been cultivated for garden purposes for over 2,000 years. The smaller kinds of turnips, which are usually either white or reddish in colour, are those chiefly grown in gardens, the large Swede turnips being strictly speaking a field crop, although they are by no means to be despised in the garden. There are many different varieties of garden turnips, but most of them are pretty much alike in flavour and size.

Turnips succeed best in cool, moist situations, but may be grown during the winter in many parts of Queensland; some varieties even may be had all the year round, except in the very hottest part of the summer.

Well-worked, moderately rich soil will grow good turnips.

The drills may be from 16 inches to 2 feet or more apart, and about 1 inch or 1½ inches deep.

Thin out the plants to 4 or 6 inches, and cultivate well whilst growing.

Turnips are sometimes attacked by aphides, which, if not checked, spread with alarming rapidity, and will soon exterminate a whole field. Spraying with kerosene emulsion or tobacco water, on first noticing the pest, will usually effectually get rid of it.

The same grub or larva, which is so destructive to young cabbage plants, frequently attacks turnips in the warm weather; and sometimes a whole crop will be cleared off in a few days by this pest. The best remedy is spraying with Paris green; care being taken, however, that the turnips are not used for some time after spraying.

BEET ROOT

The beet root *(Beta vulgaris)* is a biennial plant indigenous to the Mediterranean countries of Europe, to Northern Africa, and to Western Asia. This vegetable has been cultivated from very ancient times, and when it was first grown artificially is unknown.

The best beets are grown in fairly dry, rich, sandy loam soils; but good beet may be grown in almost any kind of soil, provided it is well broken up, and not of too stiff and clayey a nature.

As in the case of the carrot and parsnip, fresh new manure should never be used for beet root. If manuring is necessary, it should be done some time before the seed is sown, and well mixed with the soil. The seed may be sown for the winter crop in February or March, and for the summer crop in August or September; or by sowing a little every 6 weeks or so, a constant supply can be kept up all the year round.

Sow in the same way as turnips, and thin out to 8 or 9 inches. When thinning the plants, any blank spaces which may occur in the rows can be filled up, as beet stands transplanting well. There are two kinds of beet grown as garden crops—namely, the Red Beets (which may be either turnip-rooted or long-rooted) and the Silver Beets.

Of the former, only the roots are used, chiefly in the form of salads, and of the latter the leaves cooked as spinach form a very palatable dish, especially when other vegetables are scarce. They are very hardy, and will live through weather that would kill almost any other kind of vegetable. For sowing the seeds of all these crops, no better implement can be used than a Planet Junior seed drill, which does the work of three men in less time than it could be accomplished by any other means.

A NEGLECTED VEGETABLE.

MR. D. O'CONNOR, Oxley, writing on the subject of the egg-fruit, says:—Although the climate of Queensland is eminently suitable to the production of a great variety of vegetables in abundance, our markets are generally very poorly supplied; the bringal, egg-fruit, or aubergine being rarely seen. It is a vegetable of considerable excellence, and has the merit of being hardy and very

easily cultivated—as easily, in fact, as the tomato, to which it is allied, being a *Solanum*. Care should be taken to gather the bringal before it passes its prime; otherwise it is unpalatable. The purple-fruited, of which there are several varieties, is usually cultivated for the table; it should be picked before it loses its brilliant purple hue. There are several ways of cooking it; an approved way is first to boil it from 20 to 30 minutes, then to slice and fry it. When thus treated, it is a delicious vegetable. I noticed when in London and Paris, last season, that the bringal was frequently in evidence. The price quoted was about 2d. or 3d. each. It is known in London by its French name, "aubergine": this is probably because the London market is supplied from France. The bringal is largely known in India; it is also esteemed in Germany, Italy, and other European countries, but more especially in the United States of America. It is an annual, but it continues bearing for some time in Queensland. I have had it fruit three years in succession. I have grown the white kind, which is also edible, and recently a white, striped with purple, which was as good as the purple. The illustration accompanying this is copied from Anderson and Co.'s excellent catalogue.

In Calcutta, the egg-fruit, or "bringal," is served up in a delicious manner. The fruit is cut in halves, the seeds are removed, and the cavity filled with a savoury stuffing, in which is an herb which permeates the flesh of the fruit. It is then parboiled, and afterwards fried and served on toast with white sauce.

EXPERIMENTS ON POTATOES.

THE results of four years' experiments on potatoes, carried out by the Agricultural Committee of the Wilts County Council (England), have been published. The results show that potatoes may be grown with profit for at least 4 years on the same land, with artificial manures alone, provided that the dressings contain nitrogen, phosphorus, and potash in suitable forms and proportions. The omission of any one of these ingredients of the mixture, regarded as a complete manure for potatoes, has reduced both the bulk of the crop and the profit on the manures. The omission of the nitrogen has caused the greatest loss, and that of the potash the least. The application of 8½ cwt. per acre of artificial manure containing equal weights of nitrate of soda, superphosphate, and kainit proved more remunerative than either 4½ cwt. or 12¾ cwt. of the same mixture; but 16 tons per acre of stable manure, valued at 5s. a ton, produced a bigger crop and more profit than the most remunerative dressing of artificials; while the greatest yield and most remunerative results of all were secured by means of 8 tons of stable manure and 3 cwt. of nitrate of soda, or an equivalent quantity of sulphate of ammonia. The best distances for planting appear to be 10 rows to the perch and 12 inches from set to set in the rows for early potatoes, and 8 rows to the perch and 14 inches from set to set in the rows for late varieties. With respect to spraying with the Bordeaux mixture, it is advised for late, but not for early, crops. Equal weights of whole and cut seed tubers yielded very nearly the same weight of crop. In some experiments on a rotation of crops, the most profitable results were obtained from the application of 4½ cwt. of nitrate of soda, 3 cwt. of salt, and 1 cwt. of superphosphate for mangolds; 1½ cwt. of nitrate of soda and 4 cwt. of basic slag for barley; no manure for beans, but seed treated with "nitragin" for beans; and 1½ cwt. of nitrate of soda and 4 cwt. of basic slag for oats.

LIME AND ITS USES IN AGRICULTURE.

DR. AITKEN, in an article on "Lime and its Uses in Agriculture," in the transactions of the Highland and Agricultural Society of Scotland, fully explains the various effects of this common manure. Farmers commonly apply lime to supply one of the principal constituents of plants, and to cure sourness

in the soil. The sourness is due chiefly to acids secreted by the roots of plants or produced by the decay of organic matter, and these are neutralised by lime. This is generally understood; but the way in which the oxidation of organic matter is effected by means of lime has only recently been fully discovered. It was formerly supposed that the oxidation of organic matter was simply a direct union of it with the oxygen of the air; but it is now known that the action is brought about through the instrumentality of minute fungi, which increase by subdivision. These vegetable bacteria live upon the organic matter in the soil, oxidising it, and converting it into acid products, which, in excess, injure the vitality of the bacteria, and may even destroy them. In order that they may flourish, some base must be present to neutralise these acids, and lime supplies the want. Similarly, lime is of great value to the nitrifying organisms, which perform a vastly important function in the soil, neutralising the acids which they form. In excess, however, lime kills these useful bacteria, and this explains the ill effects of the too liberal or frequent application of the alkali. Again, lime is valuable to the organisms, which account for the assimilation of atmospheric nitrogen in connection with leguminous crops, for neutralising inorganic acids in the soil, for improving the physical condition of clay, and for liberating potash held in combination with silica. Some soils, however, contain an abundance of lime, and farmers have to be guided by certain signs as indicating the need of it in other soils, such as the growth of mosses and sour grasses in pasture. An ordinary analysis is not always a sure guide as to whether a soil needs lime or not, as it is beneficial in some soils which show no lack of this material; but Dr. Aitken calls attention to a method of roughly ascertaining the proportion of available lime in a soil, discovered by Dr. Holleman, which can be applied by chemists to whom samples of soils are submitted.

ANIMAL EXCRETA.

THEIR MANURIAL VALUE.

COW-DUNG is the most abundant and the least valuable in its composition of the animal manures. In Johnston Cameron's "Elements of Agricultural Chemistry," it is stated that it decomposes slowly, giving out but little heat; hence it is said to be a *cold* manure. This is quite correct, for manures such as horse-dung, which decompose rapidly in the soil, warm the latter. Decomposition in such cases is really a slow combustion.

Horse-dung is more valuable than cow-dung. It contains less water, is not so coherent, and does not form during its decomposition an unctuous mass such as cow-dung does. Horse-dung decomposes rapidly, and is therefore a *hot* manure. It is a useful addition to cow-dung, as it renders the latter more friable, whereby it can be more equably distributed throughout the soil.

Sheep-dung decomposes more rapidly than cow-dung, and not so quickly as horse-dung. It is richer in solid matters than the former.

Pig-dung.—The pig being almost an omniverous animal, its excrements vary in composition according to the nature of its foods. Its dung is soft and compact, and it decomposes slowly. It is one of the richest kinds of animal manure; but it is alleged that, when used alone as a manure, it gives a disagreeable flavour to roots. On the Continent, pig-dung is largely applied to the hemp crop.

COMPOSITION OF ANIMAL FÆCES.

One hundred parts of each contain—

	Pig.	Cow.	Sheep.	Horse.
Water	77·13	82·45	56·47	77·25
Solid matters	22·87	17·55	43·53	22·75
	100·00	100·00	100·00	100·00
Ash	8·50	2·67	5·87	3·04

The ash includes, per 100 parts—

	Pig.	Cow.	Sheep.	Horse.
Potash	3·60	2·91	8·32	11·30
Phosphoric acid	5·39	8·47	9·40	10·22

In Stockhard's "Agricultural Chemistry," the money value (in Germany) of animal excrements is given as follows:—

Cows fed during winter, 3s.
Horses fed during winter, 5s.
Sheep fed upon nearly 2 lb. hay daily, 7s. 8d.
Horses fed upon strong food during winter, 5s. 8d.

In a trial made with different kinds of dung as a manure for barley, the following results were obtained, equal quantities of manure being used:—

	Barley. lb.		Barley. lb.
Cow-dung	167	Pig-dung	233
Horse-dung ...	226	Sheep-dung ...	244

Where the excreta of animals has been allowed to lie for weeks and months in the field or in the cowyard before being gathered up for use, as may be seen almost anywhere in our farming districts, the manurial value has almost vanished owing to the constant washing by rains and drying by the sun.

Koerte found that 100 loads of dung kept in the usual wasteful way were reduced at the end of:—

	Loads.		Loads.
81 days to	73·3	sustaining a loss of	26·7
285 ,,	64·4	,, ,, ,,	35·6
384 ,,	62·5	,, ,, ,,	37·5
499 ,,	47·2	,, ,, ,,	52·8

Thus in 16 months more than one-half—and that the most valuable portion—of the manure had disappeared, leaving a highly carbonaceous matter, poor in all the elements of fertility.

The older farmyard manure is, the more soluble it will be, and consequently more liable to deterioration by exposure to rain. Perfectly fresh manure does not lose much by the action of rain upon it, especially if it be stored in large quantities. It generally contains about 70 per cent. of water and 30 per cent. of dry organic and earthy substances. Only a very small proportion of the dry matters consist of substances soluble in water. In a short time, however, the organic matters—straw, &c.—begin to ferment, one result of which process is the production of soluble compounds. Fresh manure produces but little effect when applied to crops; but when it is far advanced in decomposition (*i.e.*, well-rotted), it then contains so much soluble matter absorbable by plants that it acts as a powerful fertiliser (if used in sufficient quantity). In fresh manure, the most important constituent of its soluble portion is potash; of phosphoric acid and ammonia it contains but very small proportions. Rotten manure, on the contrary, yields to the solvent action of water large amounts of nitrogen and phosphoric acid.

The following table, showing the comparative value of animal manures, with farmyard manure as a standard, is given by Mr. C. B. Orgill in the *Journal of the Jamaica Agricultural Society*:—

100 lb. Farm-yard Manure is equal to—

125 lb. solid excrements of the cow.	3 lb. dry flesh.
75 ,, ,, ,, ,, horse.	5 ,, pigeon's-dung.
21 ,, liquid ,, ,, cow.	15 ,, liquid blood.
16 ,, ,, ,, ,, horse.	4 ,, dry blood.
98 ,, mixed ,, ,, cow.	3 ,, feathers.
54 ,, ,, ,, ,, horse.	3 ,, cow-hair.
36 ,, ,, ,, ,, sheep.	3 ,, horn shavings.
64 ,, ,, ,, ,, pig.	3½ ,, dry woollen rags.

VEGETABLE FAT.

BY HENRY A. TARDENT,
Manager, Biggenden Experiment Farm.

WHEN we compare our agriculture with that of countries enjoying a climate similar to ours, there seems a lack in the cultivation of some sort of oil-producing plant. Still we feel daily the need of such a plant in the economy of a well-managed farm. In consequence of the increasing use of cream separators, our calves are being now mostly fed on poor skimmed milk. This results in dysentery and other diseases, and will leave us ere long with degenerated breeds of milkers. Pigs are also in need of some oily food. Even the women folk and growing children would be all the better for some sort of vegetable oil in their diet.

Where shall we get it from?

The olive, both under the form of expressed oil and as pickled fruit, is of course the vegetable fat *par excellence*. No doubt, in years to come, the olive will occupy a large place in our rural economy. Our soil and climate seem to be admirably adapted for its profitable growth and cultivation. It seems to do well all along our eastern coast land. But west of the range, our vast inland plateau with its sandy soil and stony ridges, with its dry and bracing climate, seems to be most pre-eminently adapted for that sort of culture.

At Westbrook Head Station there is a magnificent olive grove, planted some 20 years ago. Although the trees hardly received any care, most of them are vigorous and healthy. Whilst I was at the Westbrook Experiment Farm, the genial host of Westbrook Head Station, Mr. J. Jennings, kindly authorised me to prune all the trees, and to take truncheons from them. The result was not only beautifully shaped trees, but a most abundant crop of fruit on all the varieties—the branches bending under the weight of fruits were the very image of riches and plenty. When pickled, they turned out of excellent taste and flavour, and were unsurpassed by any imported article.

If we were aware of the real value of the olive, it would be found growing over the whole of the Downs ere long. It would be planted on all the stony ridges which are now useless, and where it would bear abundantly; also along each farm's boundaries. It would beautify the landscape, act as a breakwind against the cold westerlies of winter, and afford a beautiful shade for man and cattle in summer; furthermore it would, in addition, provide one of the most nutritious and useful of fruits.

Unfortunately, it will be many years ere that ideal is reached. The trees are not yet planted, and when planted they take many years before they come into bearing. In the meantime we want some sort of quick-growing oil-producing plants. Walnuts, hazel nuts, and other trees are excluded for the same reasons given above, besides being less adapted to our climate and soil. Cotton is believed to be not yet a paying crop until labour is somewhat cheaper than it is at present.* The castor oil plant will produce an excellent lubricating and leather-softening oil at probably remunerative prices; but it spreads like a bad weed, ripens very unevenly, and, as an esculent, is appreciated only by Chinamen, who seem to have a specially built [stomach to digest it. Rape, mustard, sunflower, which are all good for some purposes, have all some drawback which prevents them from entering into general cultivation.

After numerous experiments with a great variety of oil-producing plants, I came to the conclusion that the one which would answer best all purposes was the so-called "Peanut" or "Earthnut" (*Arachis hypogea*). It belongs to the *Leguminosa* family, and is, properly speaking, not a nut but a bean. Like all the other members of that numerous family, its roots are covered with numerous nodosites full of minute microbes, which live on nitrogen, and then fix it in the

* The cotton plant would scarcely prove a success on the cool tablelands of Southern Queensland.—Ed. *Q.A.J.*

ground. It is thus a nitrogen-producing plant. It does not exhaust the soil very much of mineral matters, the oil being mostly extracted by the plant direct from the atmosphere. The stem is somewhat hairy, whilst the leaves are winged and alternate. The flowers of the usual shape in *Leguminosa* are yellow. The beans or nuts are usually found in pairs in a sort of pod hanging at the end of a thread a few inches long. But there is a strange peculiarity in that plant. It spreads spider-like on the ground, and buries its pods in the ground at a depth varying between 1 and 4 inches. It is there in the ground where they ripen. That habit is an indication of how to prepare the land. The best way is to prepare it in the same manner as for onions. Give first a deep ploughing. Then let the land fallow for a few months, after which work the surface to a fine tilth to a depth of 2 or 3 inches by using alternately the roller and spading and tooth harrows. Such a way of working the soil prevents the beans from being buried too deep, in which case they are mostly lost at harvesting time. Sow in rows 3 feet apart, leaving 1 foot between each seed in the row. It is a good plan to soak the seed for a couple of days before sowing, not forgetting to change the water from time to time. Whilst the plant is growing, keep the soil well stirred and pulverised by means of the Planet Junior and other light cultivators. Never allow the surface to cake. In a couple of months the plants will have covered the whole field, after which they can take care of themselves. If the soil is of a gentle, sandy, loamy nature, and has been kept well pulverised, the little pods will penetrate easily into it, and the crop will be something enormous. In the autumn, when the soil has been softened by some light rain, the plant is easily lifted, roots, beans, and all, the latter coming out clean from the ground and hanging on to the plant. They are then left to dry for a couple of days on the field, after which they are stored in a barn until they can be picked at leisure.

When one has not first seen it, it is difficult to realise what a tremendous crop can be got from 1 acre. It is not rare to find that from 300 to 500 seeds have been produced from 1 seed. When first soaked in salt water, and then boiled or roasted, those seeds form one of the most nutritious and wholesome of foods, so much so, in fact, that of late doctors have begun to feed their consumptive patients on it, as they have found that no other food is comparable to it for producing fat and increasing weight.

It is especially good for their emaciated women and for growing children. In the bush, and especially in the far West, where a vegetable diet is often so difficult to procure, the earthnut would form an invaluable adjunct to the usual meat diet. As an oil-producer, the earthnut is hardly surpassed by any other plant. The oil made from it is clear, inodorous, palatable, and not quite as *fat* as olive oil. It hardly ever gets rancid. It is largely used as an esculent and condiment. It is also in great demand in certain industries. Amongst others a high-class soap is made from it.

As far as I can see, the earthnut appears to me to be the very thing we want to grow now in Queensland to render to the skimmed milk the fat it wants to form a healthy food for our calves. Pigs thrive on it remarkably well too, and are only too glad to be entrusted with doing the harvesting themselves.

The *Arachis hypogea* originates probably from Brazil and Central America, whence it has spread all over Southern Europe and to the warmer parts of Asia and Africa. It is extensively grown in the United States of America, also in Spain and Italy. It is not only grown largely in the south of France, but, in addition, that country imports over 200,000,000 lb. of the nut annually. Here in Australia it is likely to do well nearly all over the continent. It stands drought well, is not much afraid of wet, but it is sensitive to cold. It should therefore be planted in the spring, after the last frost is over—say from September to November, inclusive, according to latitude and altitude of places.

THE CULTIVATION OF BROOM CORN.

By DANIEL JONES.

PRACTICAL demonstrations in rural districts of suggestions leading to diversification of crops are more than ever needed at the present time. Especially is it the case in those districts where our farmers have for years engaged in the cultivation of such crops as maize, potatoes or cereals, and where, by continuous cropping or by the vicissitudes of climate, they find the financial ultimate anything but satisfactory. This phase of agronomic routine has latterly been very much impressed upon my mind during a recent visit to the Maranoa district, notably to the region contiguous to Roma, and more especially in the settlements of Wallumbilla and Pickagenny. There I observed indications of an opportunity lost by many of the farmers who were engaged in wheat-growing, and who, in successive seasons, have, by the incidence of drought, for the most part lost their entire wheat crop. Were the farmers fully seized of the advantages attendant on the cultivation of broom corn in those localities, a very decided amelioration of their prospects would have resulted had they, upon the first warning of disaster to a prospective wheat yield, given timely attention to the alternative crop immediately practicable which they would have found in broom corn.

The few farmers in those districts who availed themselves of the advantage of the season on the failure of the wheat crop, and who, on the land sown with wheat that failed to mature owing to drought, sowed broom corn, were fortunate enough to harvest a crop that, to some minor extent, compensated them for the major loss of the staple product. Thus were most farmers prepared, in such a contingency, to alternate these crops, the aggregate of our agrarian losses would be very much minimised, more especially in the wheat-producing regions of our Western country, where a crop such as broom corn, that is light in transit over the long rail journey to the coast, and which has a further special advantage to commend it—viz., its comparative drought-resisting qualities—is of especial value. These are all very important reasons why the farmers of Southern Queensland should give some attention to the cultivation of this product.

Having been for some years past the largest producer in Queensland of this particular product, I wish not only to put forth as tersely as possible the practical experience gained by myself, but also much as seems to me useful and practical of the gleanings of other cultivators in older countries where this staple has been grown, not as with us chiefly as a catch or emergency crop, but as a part of a regular system of rotation. Hence, in the forthcoming articles, I propose, as leisure permits, to enter into a somewhat exhaustive dissertation anent this topic, embracing in its features what is to us most important -the commercial aspects of the trade, no less than the conditions incidental to its cultivation and preparation for market.

In order to let the prospective grower become possessed of the full facts relating to this subject, I propose in a future article to deal with the supply and demand, not only of our own colony, but also in the neighbouring colonies, where we must have an outlet in the very possible contingency of our own supply overtaking the local demand. It must not be taken for granted by any means that there exists an unlimited local demand for the article; still it must be carefully noted that hitherto the broom manufacturing factories in Brisbane have never been able to secure enough local broom corn to fill a tithe of their demands; but they have always had to import largely from America and New South Wales, sometimes at an extravagant cost embarrassing to the manufacturer and no less inimical to the interests of the trader and user of the articles. It will thus at the outset be well to understand that there is a limit to demand; but prospective indications augur that some years must elapse before the local or Australian market is glutted, and growers may therefore take heart of grace at this juncture.

One special feature to be remembered is, that this product, if well cured, will continue in good condition if kept from vermin for a considerable time, and will not, as is the case with ordinary farm products, rapidly deteriorate. Thus the farmer can safely hold for a favourable market, and dispose of his crop accordingly. So erratic and meagre has been the supply during this last season, not only from America, but also from New South Wales, that the Victorian Government has deemed the matter of stimulating local production of this article so important that a bonus has been offered to growers in order to facilitate the operations and supply the demand of their own factories. I am of opinion that despite this bounty system, when our local growers fully understand the advantages we have in climatic conditions beyond the reach of our southern neighbours, it will be only a matter of time when Queensland broom corn will be worked up in Victorian factories with their modern machinery to the exclusion of the American article.

VARIETIES.

Broom corn, or broom millet, as it is sometimes designated, belongs to the Sorghum family, the variety here described being *Sorghum vulgare*, sometimes designated *Sorghum dura*. The name, however, given by Mr. F. M. Bailey, Government Botanist, is *Sorghum cernuum*. Of the known varieties hitherto introduced into this colony by the Department of Agriculture from America some 5 years ago, two rank for some purposes amongst the best. These are the Californian Golden and the Improved Evergreen, both of which I have grown with satisfactory results. Of the two varieties, I prefer, for prolific cropping, the Californian Golden, as it is a good, vigorous grower, with firm upstanding brush. It cures a good bright colour, makes a satisfactory hurl, and is not so prone to grow crooked in the brush as some varieties. The brush clearing itself rather freely from the sheaf is not so congenial a harbour for aphis—the bane of the manufacturer, who abhors the red markings upon his clean hurl, which is the evidence of the presence of these pests.

The Improved Evergreen is not, in my experience, quite so luxuriant a cropper as the former variety, but it is less likely to throw so much crooked brush, and thus needs less attention in bending. The more enduring green colour of the hurl or brush is by some manufacturers on this account most approved of. Thus, in Sydney factories, the fashions trend more to green-coloured brooms, while in our metropolis and in Melbourne I observe that light-coloured brooms preponderate. Consequently either variety is acceptable, and carries its value in equal ratio. A newer variety, more recently introduced to this colony and New South Wales, is the White Italian. This I find from experience to be the heaviest yielder, and, if properly cultivated and cured, carries all the merits of the other sorts mentioned. As its name indicates, it is a pale variety, and, when carefully attended to, is one eminently suitable for the manufacture of a high-class broom, and will command the foremost value in the market.

It would be scarcely within the realms of the probable that no demerit should attach to an article of commerce. So it is with this variety. Its most exasperating feature is its persistence in bearing crooked broom-heads. This is owing probably to its vigorous growth of hurl and heavy seeding propensities. No feature of this crop is so annoying to the grower as this matter of crooked brush, and no pains should be spared in securing that the conditions of cultivation are such as to prevent this happening. Crooked brush means defective quality, lower price, much care and trouble in cleaning, sorting, packing, and general exasperation to all using it; otherwise this variety is suitable for our commercial needs, and attention to the crop in bending will avoid the defect I have here described. There are several other varieties not known to me by name, many of them of very fair quality. These are often distinguished by the black, red, or pale-brown colour of their seeds. In this connection it would be well to impress upon growers' habits of observation, as thus the selection of new and improved sorts may be discovered as Nature's processes of inoculation or hybridising, which sometimes improve though sometimes deteriorate

them. It should be the aim of progressive growers to obtain a corn short in status with fair length of hurl, and a minimum of seed. Such a species would materially help to cheapen the cost of production, and would be an advantage in harvesting. There is a variety often produced in New South Wales that is very indifferently valued by the factory proprietors; it is a red-seed variety, coarse and unsatisfactory in colour, and realises as low as from 5s. to 15s. per cwt., while the other varieties, if in good condition, will range as high as 20s. to 25s. per cwt. Consequently the farmer contemplating the production of this crop will find it to his advantage to first procure the most improved sorts as nearly true to name as possible, which will, to some extent, indicate the treatment in tillage to be observed, and will assure the commercial value of the fibre.

It is chiefly by the selection of good varieties approved for the purposes required by the exactions of the trade, that the farmer can best make this crop most profitable. In all phases of rural economy, the producer must needs study the requirements of his customers, and in no instance is this truth more pronounced than in the one in question. The farmer once in possession of a strain of seed, prolific as regards yield and profitable as regards value, will do well to take every precaution to keep his seed pure, by which means the uniformity of the resulting crop as regards colour, length of fibre, and toughness, will prove of mutual advantage to the grower, no less than the manufacturer whose many mechanical operations are considerably simplified and expedited when in possession of material having these characteristics.

Dairying.

THE DAIRYING INDUSTRY IN NEW SOUTH WALES.

A CORRESPONDENT of the *Sydney Daily Telegraph* points out a danger to the butter industry in New South Wales owing to the enormous increase of small separators, and he even suggests the idea that a Government inquiry into the matter is warranted. He says:—

Coincident with the marvellous development of the dairying industry, which has done, and is doing, so much for the farming population of Australia, has been the spread of the small separator system throughout the dairying districts. During the last twelve months this has been especially noticeable, and the number of small plants which have gone into use must represent an enormous figure. The central creamery system in consequence is suffering a rude shock. It may recover from it, and it may not. The whole system has reached such a stage that Government inquiry at least appears to be warranted. "Why?" many people will be inclined to ask. It can be answered in a few words.

The hand separators produce cream of an inferior grade. They take the industry back almost to the old dairy methods. A dairyman now, as a rule, merely separates his own cream, and, storing it for two or three days, then carts it to the nearest butter factory for sale. It is a great saving to him, because he has now to make periodical trips to the central creamery with his cream instead of twice daily as before with his milk. Near' _ very producer now owns his own small plant, whereas formerly the hand separators were practically unknown. The result of all these developments is that the butter of many of the districts is sadly deteriorating.

Mr. R. C. McDouall, the first man to embark upon the dairy business on a large scale in the Hunter River district, has just been giving an opinion on the whole matter that is worthy of consideration. He has drawn attention to the fact that, while experts and officials in Victoria and New South Wales practically admit the great danger of the system so rapidly spreading, no steps are being taken to regulate the evil.

"To any thoughtful and unprejudiced mind," he says, "the matter thus opened up must be perfectly plain, and no one with any claim to common sense will attempt to controvert the theory that there are grounds for seriously taking up the whole question officially, particularly when it is seen that some of the butter-makers are finding themselves compelled to take action so far as it lays within their grasp. What more striking illustration of the evil of the system is required than the result of the State butter competition decided last week? No doubt in each of the fourteen entries for the prizes, the best cream available was used and everything done scientifically with the aid of the most modern appliances to produce the best article. Unfortunately, in one sense, these samples had to be detained in cold storage for 2 months, to prove their export value, but it was fortunate in another way that this condition was enforced. The results of the test are, in the main, lamentable. Presuming, for the sake of argument, that the butter gaining first honours, with 93 points out of a possible 100, is the very best that can be made in the colony, the feature which will strike the careful observer most is that the second-prize article fell short in quality by nearly 20 per cent.; or, to bring the matter home more forcefully, for every £100 worth of butter sold in England by the first prize-winner only £80 would be received for the next best. But the case is even worse, when we recollect that butter of such a class is practically unsaleable in the home market, and could not thus be made to pay. But what of the balance of the 14 samples! The whole difficulty is the outcome of producing inferior cream, and the hand separator system is responsible for it. The general cry of the butter-makers throughout the colony is that they cannot turn out a first-class article for the reason advanced. While the prevailing practice exists, there will be no improvement.

Mr. McDouall merely expresses the opinions of scores of other dairymen in a large way when he urges that combination in this matter is urgent.

"Doubtless," he urges, "the recent dry seasons, with their attendant short supply of milk, have had considerable influence upon this question. Milk has been so short that there has been no difficulty in disposing of the small quantity of butter manufactured at a fairly high price. One good season, however, will most assuredly alter the position of things, and many who have during the past year or two invested their money in a hand separator will regret that they did not give that matter a little more thought."

It will be easily understood from these views that the matter is one of moment, for if we cannot place a good article upon the English market the business of exporting must practically prove to be a failure. Combination on the part of the manufacturers is one remedy, and Government interference another. One of two courses will eventually have to be taken if the great dairying industry is to be maintained and developed.

On this subject Mr. John Mahon, Principal of the Queensland Agricultural College, whose intimate knowledge of dairying in all its branches gives weight to his opinion, says:—

I wish to point out that the system (that of hand-separating), if carried out to any great extent, will surely bring about most serious results as regards the quality of Queensland butter, apart from the enormous unnecessary expenditure for hand-machines, which entail a deal of extra labour, as compared with the central creamery system. A cream separator in the hands of individual farmers is but one remove from the old system of each man manufacturing his own article. The system is expensive and dangerous to the welfare of the industry, and should therefore be discouraged as much as possible. Cream separators in the hands of 150 dairymen mean 150 different grades of cream—thick cream, thin, sweet, sour, cooled, uncooled, clean, and dirty. These creams may be delivered to one or two depôts, where the good and bad are mixed together, resulting in an impossibility for the manufacturer to turn out a good article. Then, again, small quantities do not carry so well as large quantities: there is also a great deal lost in handling small quantities.

The system of each farmer having a separator is absurd in thickly populated districts, contrary to all reason, and increases the cost of manufacture very considerably.

The reason farmers are procuring hand-separators may be attributed to the fact that they are dissatisfied with the Babcock milk-test results of the proprietary factories, a matter that might readily be overcome by a number of farmers procuring a Babcock tester and doing their own testing; this would only entail an outlay of about £3 to £4.

Again, we have a paragraph written in the course of February, 1898, by a correspondent who considers evidently that the quality of then recent shipments of butter was not what it should be.

Mr. Mahon, writing on 23rd February, 1898, on the subject of this paragraph, says:—

In reference to a paragraph that appeared in the *Brisbane Courier* of Tuesday, 22nd February, under the heading of "Our Dairying Industry," I wish to inform you that there is no authentic information to warrant such a statement being published, especially as regards the quality of recent shipments of butter, and prices obtained in the London market. It is a well-known fact that all butter is sold privately in London, and making known the actual prices realised would be contrary to the interests of traders at this end, as also the traders in London.

I am in a position to be able to state that all butter shipped this season (bearing the Government brand) was equal in quality to that shipped by the "Jumna" last year, and even some brands I found to be very much improved.

Some manufacturers are turning out a good article, but in many cases not of an even grade, which may be attributed to the cream being ripened in the ordinary 10-gallon milk cans. Under such methods it is impossible to turn out a uniform quality of butter; and the sooner proper cream vats are substituted for this system, the better for those concerned.

The system of having small cream separators scattered all over the various dairying centres, and each farmer doing his own cream separating, is certainly wrong, and cannot bring about good results. The expense in the way of labour, such as separating, cream carting, &c., apart from the cost of the separator, is much greater than the central creamery system, all of which has a tendency to increase the cost of manufacturing.

However, during my travels, I have gathered information from many farmers who assure me that their reason for securing their own separators and separating their own milk is due to the unsatisfactory results they have obtained from the Babcock milk-tester at various creameries.

Although not approving of the above system myself, I may mention that, on my visiting the Murwillumbah butter factory yesterday, the manager (Mr. McIlwraith) informed me that at the present time there are sixty farmers (including some in Queensland) supplying him with cream from their own separators, and only two supplying milk.

EXPORT OF BUTTER FROM AUSTRALASIA.

THE amount of butter sent from these colonies to the United Kingdom in the month of December, 1898, was 44,600 cwt., and the first fortnight in January, 1899, showed an export to Great Britain of over 46,000 cwt., or about one-seventh of the total monthly requirements of the United Kingdom, the annual imports amounting in 1898 to 3,204,093 cwt. If good prices are to be maintained for our produce sent to England, the exports should be more evenly distributed over the year. The quantity of butter exported thither during the first fortnight of January more than equalled that arriving from Denmark during the same period. This can but have the effect of depressing the market, and therefore producers would do well to study how to maintain a steady export

trade without unduly overstocking the home market. From butter to rabbits is a great jump, but the principle applies here as well. The enormous export of rabbits to London has had the effect of so reducing prices that the poorer classes, who might be expected to be large consumers of frozen beef and mutton, turn to the imported rabbit as an article of diet to the detriment of the frozen meat trade.

WEIGHTY BULLOCKS OF OLDEN TIMES.

The disappearance of the extraordinarily heavy cattle of olden times is a subject which is dealt with in the following short but interesting article by "Historian," in the *Farmer and Stockbreeder.* Certainly very large bullocks are occasionally to be met with. We remember to have seen gigantic bullocks figuring in the annual "Mardi gras" procession in Paris. Such beasts were, however, systematically fed up for the occasion. Several very exceptionally heavy animals have been shown at the Exhibitions of the National Association at Bowen Park, but these are exceptions.

The average weight of a draft of fat cattle to-day will probably not average more than 700 or 800 lb., and the reasons for this reduced weight are set forth in the article we reproduce:—

SOME GIANT CATTLE.

Formerly, as most people are aware, it was customary to work oxen in the fields very generally, and after young steers had been trained to the yoke they sometimes did duty for 6 or 8 years, so that those of the larger breeds were fed to great weights when fattened. Sussex cattle are of immense stature, and those of olden times were more bony and gigantic than now; consequently they were very massive when fed to their utmost capacity of flesh and fat accumulation. The record of the celebrated Burton ox, fattened at Burton Park, near Petworth, states that the height of the animal was 16½ hands, his measurement from the back of the horns to the tail, 8 feet; his breadth across the back, between the hip bones, 2 feet 8 inches; his girth at the heart region, 10 feet; and his weight 287 stone 4 lb. Youatt states that Mr. Ellman had a Sussex ox which weighed 214 stones, this one measuring 9 feet 6 inches from the crown of his head to his rump, and girthing 9 feet behind shoulders. Mr. Edsaw's ox was still heavier, weighing 216 stone, and his girth was 10½ feet.

The weight of the famous Lincolnshire ox of the last century was 2,800 lb., the height of which was stated to be 6 feet 4 inches, and his width across the haunches 3 feet 4 inches. Other famous oxen slaughtered at the latter part of the last century were one at Leek, which weighed 2,369 lb., and another in the Isle of Lewis, of the Hebrides, whose weight was 2,423 lb. It is stated in Pitt's "Agricultural Survey of Staffordshire" that in 1794 a Longhorn ox belonging to Lord Donegal was slaughtered, the carcass weight of which was 1,988 lb., the tallow being 200 lb., and weight of the hide 177 lb. Pitt also informs us that "At Mr. Huskison's, at Oxley, near Wolverhampton, there have been two instances of cows, bred on the farm and fattened there, to upwards of 18 score lb. per quarter, one weighing 374 lb. per quarter. These cows made to the butcher 40 guineas each." Most likely such bulky, massive carcasses, over-larded with fat, would yield far less nowadays. Times have changed so much that the Smithfield Club will no longer have cows of any kind at its shows. The London butchers gave very little for them in the latter years when they did appear. Consumers, they say, will only buy small joints of prime quality, not made too fat, and some of the chilled American beef would suit the popular taste far better than the big joints of fattened beeves of either sex.

SMITHFIELD GIANTS AND CAUSES OF THEIR DISAPPEARANCE

At the very first Smithfield Club Show in 1799, a Hereford ox fed by Mr. Grace, of Buckinghamshire, stood 7 feet high, weighed upwards of 260 stone, and measured in girth 12 feet 4 inches, while Mr. Westcar's first prize bullock,

which sold for 100 guineas, was 8 feet 11 inches long, 6 feet 7 inches high, 10 feet 4 inches in girth, weighing nearly 300 stones. The beasts exhibited at all the earlier shows had among them a large proportion of what would be termed giants nowadays, but the weighbridge was not in use as it is now, and the scalings of only a comparative few have been handed down to us. Two causes have been in active operation to lessen the stature of beasts fed for the shambles ever since about the middle of the present century. The one is the rapid and general decline in the system of working oxen, for which no adequate reason has been adduced, except that it was found that lands could be ploughed and worked for seed beds much more speedily by horse than ox labour. When, however, against this was placed the fact that the ox, bred on the farm, matured into his greatest value for sale after performing his duty at the yoke 4 or 5 years, and that horses, on the contrary, would get of less value the older they grew, the advantages of the change do not appear so very patent, unless, indeed, young cart mares of some value are worked which will breed valuable foals as well as perform the tillage operations.

The other cause is the change in the popular taste of beef consumers requiring small joints of good quality flesh not over-larded with much fat, instead of what they were accustomed to have catered for them in the old days. To meet this modern popular demand most economically and effectively, calves have to be fattened while in a state of growth, so as to be matured for the shambles, at from 16 to 22 months old; and to enable them to come to this early maturity and produce the high quality meat required, the calves would have to be sired by a pure-bred bull. They would no doubt progress with still greater rapidity and be of still better quality by having pure blood on both sides, but this would scarcely be possible in carrying out ordinary grazing in the majority of circumstances. Unless graziers can keep cows and breed their own grazing stock, which the majority declare they are unable to do, they can only work with the material available at markets and fairs. No doubt a far better way of supplying themselves with an approximation at least of the right kind of material has been suggested, which is that of making special agreements with the owners of dairy herds, the chief clause of which would be that, if the latter would sire their calves by a pedigree bull, the contracting grazier will take from them the bantlings at a given price when only a few days old. The grazier would rear these baby calves on milk substitutes, thickening their soups more and more with meals as they grow bigger, but endeavouring in all cases to keep them progressing, and so to feed them subsequently that they will mature for the shambles at the early age above stated.

The *Sydney Stock and Station Journal* has an opportune note of a "Mammoth Ox," of the P7Y brand, which is no doubt the heaviest bullock ever seen in Australia. He was bred by Messrs. Smith, Debney, and Co. at Monkira, Diamantina River, Queensland, and was exhibited at the Adelaide Royal Society's Exhibition in 1893, obtaining champion prize. His live weight was 3,043 lb., and when dressed he turned the scale at 1,992 lb. At the same time two other shorthorns bearing the P7Y brand were exhibited, and weighed, alive, 2,845 lb. and 2,570 lb. respectively. The trio walked about 700 miles with a mob of fat cattle to Adelaide.

QUEENSLAND BUTTER.

A GLASGOW firm, reporting on a recent shipment of Queensland butter to England, says:—"The Queensland butter arrived in good order and condition, and, while not perfect in its manufacture generally, was saleable, and, possessing a particularly pale colour, was easily picked up by buyers. The greatest difficulty this season with the colonial butters has been their high colours. The butters, however, from Queensland are all pale, and on this qualification alone they are more easily sold. The general style of the butter was good, the

texture and colour being uniform throughout, while in a few cases, owing to the slight tendency of heat, the flavour tended more to the greasy side. Our buyers, who have been long educated to the pale colour of Danish butter and margarin mixtures, will not take a deep-coloured butter, even though the quality be choicest, and in this case they consider that the price must be lowered if a sale is to result."

The Queensland butter-makers have evidently, from this, struck the home taste as to colour; it only remains for them to keep the colour uniform, provided the butter itself is all that can be desired.

THE AYRSHIRE COW.

During the last few years a good deal has been said and written about the Ayrshire cow, both in her favour and against her. Being closely associated with their breeding and management all my days, I will offer you a few remarks on what experience I have obtained during that time. A good deal has been written about the origin of the Ayrshire. Some hold that there has been a cross of the Highland in them, and others have various other theories, and try to trace them back for a considerable number of years. About that I don't profess to know much. One thing, we have now a distinct dairy breed, which every breeder and fancier, who is doing his duty, should endeavour to bring to the highest state of perfection, both as regards her own appearance and also her rent-paying and profit-making capacity. It is principally on the Ayrshire cow that a large number of the Ayrshire farmers have to depend for paying their rent, and it is of the greatest importance that he should have a stock of cows that will produce the greatest amount of good, rich milk on the smallest amount of feeding. In order to know about breeding thoroughly you must serve your time to the trade, make yourself a thorough milker, watch all their various habits, and study the different strains. Even after being amongst them for years you can always be learning something new. There seems to be a great difference of opinion amongst a certain class of people about what should be the proper points of an ideal cow; but almost all thorough, practical breeders are pretty well agreed on that point, if they could only produce what they would like to be at. Most people have a natural tendency to run up the kind they happen to have at the present time. The following are what I would consider the proper points for an ideal Ayrshire cow:—The cow should be a fair, good size, but not too large. The head should be a medium size, the muzzle broad; broad between the eyes, and the eyes clear and bright, and standing out prominently. The forehead should be wide, and the horns should stand well up, and not be too long or too thick, and there should be a good width between the tips. The neck should not be too long, but should be free from any thick fleshiness. The shoulder should not stand up like the roof of a house, but should be nicely rounded, and the blades should fit nicely into the body, and not bulge out and work up and down loosely. The fore shoulder should be well placed into the animal, and not be sticking out prominently and ugly-looking. The animal should carry a nice thickness of flesh behind the shoulder when not milking, and she should be well thickened out and deep round the lungs and heart, so as they may have room to do their work properly. The back should be straight from the shoulder to the end of rump, and the ribs should be well sprung out from the back. The hook or tor bones should be fairly wide and fairly prominent. Do not have them too wide and pointed, for that and a high-cutting shoulder means extra feeding to keep the animal in decent condition. The hind quarters should be long and square, with a nice place for the tail to fit properly into. The thighs should be fairly thick, but not bulged out and beefy, and the hock should have a nice, natural curve. The cow should have fine flat bones, show good substance, be deep at the flank, and the flank should run well into the thigh. The skin should be thin and loose, and covered with a nice silky coat of hair. The udder, when filled with milk, should be long, broad, and level,

and run well on to the belly and up behind. The teats should sit well apart, hang perpendicularly; be of a good length, a little pointed, have a nice thin skin, and have a fine silky feeling when you catch them. You should feel the milk veins stand out large and prominent along the belly in front of the udder, and there should be a good fair hole that will hold the point of your finger where the milk veins go through the rim of the belly. When the cow is milked the udder should go well away, and hang like a nice, loose skin, and not be bulky. Those are the chief points of a good cow, and having got those points they must be put together in a free and easy natural sort of way, so that the animal may have a nice jaunty gait with her. Do not have a stiffness at any point as if a joiner had put her together. All these points are not necessary for a heavy milking cow. You can have a great milker almost any shape. The greater the number of those points, combined with a good milker, the greater will be the value of the animal. Breed cows of that description, and you will find a good market for them anywhere and at any time. Having got the ideal cow, the next point is to get a good bull to mate with her, to produce something equal to and better than either if possible. The selection of a good bull is of the greatest importance, and it is with that that the breeder should take the greatest trouble. The points of a good bull are the same as those described for a good cow, only you want him stronger in all his points, and having a good masculine appearance. By that I do not mean ugliness; a good many people seem to think that strength and masculine appearance mean ugliness. In all breeds, in wild animals, and in the human being, it is natural for the male to be stronger, and not so finely and evenly shaped and filled out in all his points as the female. If you work with a very fine, evenly-shaped, feminine-looking bull you are striving against Nature, and that is a risky game to play at. In the selection of a bull there are two points I would consider necessary—(1) He should be of good quality, strong, and hardy, and have a good constitution; (2) his dam should be a good healthy cow, giving a good quantity of rich milk, having a good big teat, and be easily milked. Make sure of those two points, then get as many of the other points already described as possible.—Adam L. Montgomerie, in the *Scottish Farmer*.

THE TUBERCULIN TEST.

EXPERIMENTS have been made by order of the Cheshire County Council with tuberculin on two herds, and their report has been published. It appears that 54 animals were tested in one instance, of which 14 re-acted, and 3 were doubtful. In the second lot 3 out of 17 were tuberculous, and 1 doubtful. Of those which re-acted 9 were slaughtered, and tuberculous lesions were found in all, the glands, liver, and lungs being chiefly affected. The carcasses were, however, certified by the veterinary surgeons to be sound and fit for human food. The value of these animals on the farm was stated at £149 18s. 6d. After slaughter they were sold at £97 7s., or at a loss of £52 11s. 6d. The council are satisfied that the disease is not hereditary.

THE PRINCIPLES OF SHEEP-BREEDING.

No. 1.

By HERMANN SCHMIDT.

VERY few of our stock-breeders have the time or the opportunities of making themselves familiar with the scientific principles of breeding domestic animals. For this reason, the writer has undertaken to place before the reader such information regarding this subject as will give him a good insight into it. It

will then be shown how to apply the same to wool-growing particularly. I shall thus treat the subject under the following heads, namely :—

1. The rational principles of breeding as they apply to every species of animals and plants.
2. The wool from a physiological point of view and as a product for the market.
3. Woollen manufacture, as a means of illustration why certain qualities of the wool are especially desirable and others are not so.
4. The methods to be adopted in improving a breed of sheep.
5. An historical sketch of the development of fine wool-growing in the different countries where merinos are kept.

The chief purpose for which domestic animals are bred is the conversion of vegetable food into animal products, such as milk, meat, wool, &c., which are in reality nothing else but more desirable forms, and we may consider a sheep farm with the words of a celebrated French sheep-breeder, Matthieu de Dombasle, as an establishment for the changing of vegetable farm produce or pasture by the agency of sheep into money, and it is evident that those animals answer the purposes of the breeder best that produce the greatest returns for comparatively small quantities of food consumed, and for comparatively small amounts of outlay that have been invested in them.

In order to carry on the breeding of any of our domestic animals with financial success we must be guided by nothing but strictly practical principles. We must carefully avoid, therefore, any notions that may be the result of prejudice. We rear wool-growing sheep for different purposes than we do racehorses, pigeons, or canaries. Our ideal of the most perfect sheep should be closely connected with its suitability for our purposes, and this again can only be obtained by paying the fullest attention to every particular that has to contribute its share in making up the results we desire.

The believers in the traditions of the Bible mostly maintain that the domestic animals of our days were created for the special purpose of serving mankind, and were at the very beginning invested by the Creator with those qualities which render them now so useful to us.

Others believe that our horses, cattle, sheep, &c., have descended from originally wild animals, that were caught, probably when young, and were domesticated. Notwithstanding the traditions of the Bible, we are justified in believing that it is by the last-named method rather that our ancestors obtained animals suitable for their services. It is highly probable that our horses have descended from the ancestors of those horses now running wild in some parts of Asia; our cattle from those of the wild Urox or Aurox still at large in the forests of Russia, or from other wild cattle (*Chillingham*). The fine-woolled sheep of our times were obtained in the same way, but the races from which they were originally derived are probably extinct. It is very unlikely that our fine and heavy woolled sheep have descended from ancestors having no wool at all, but short coarse hair, such as the muflon, &c.

If we assume that animals and plants came into existence by a mysterious act, called creation, brought about by the will of an individual being, there is no room left for further inquiry, and we must then accept it as a fact that the present condition of animals and plants is the result of the Creator's will, and not of any laws, or, as Socrates called it, "necessities innate in natural objects." Matters, however, assume a very different aspect if, without binding ourselves to a certain time-honoured belief, we carefully investigate the facts which the history of our earth has brought to light.

From what geology teaches us, we must conclude that our globe has undergone a variety of changes, and we can trace, from the fossils and their surroundings, a gradual development of animals and plants from very low forms of life into their present state of perfection. It has also been proved that these changes in the condition of our earth were not always brought about by violent actions of a volcanic nature, but mostly gradually, and that the same causes, to

which those changes are to be attributed, are still in operation. These facts sufficiently account, as I shall try to explain later on, for the great variety of size, shape, colour, and disposition of the wild animals and plants that now exist.

Some of the lowest forms of animals by which in primeval time the water and the land were solely inhabited are still in existence, some of them in slightly different forms. Whilst the animals were ascending from the lower to the higher forms of life, they developed in different directions; and we now meet with forms so widely different from each other as molluscs, birds, fishes, quadrupeds, &c. Certain groups of animals are very similar to each other, such as goats and sheep, oxen, antelopes, deer, &c.

In order to assign to certain animals their place in the animal kingdom, naturalists have divided the same into classes, orders, families, &c. The breeder of domestic animals is especially interested in what the naturalist calls *genus* (order), species (kind), and variety.

By genus, we understand a group of animals very similar to each other, yet sufficiently unlike in their internal organisation as to preclude them from having offspring capable of permanent propagation.

For instance, all the horse family, such as horses, donkeys, zebras, &c., belong to the genus *Equus*, of which the domestic horse forms the species of *Caballus;* the donkey, the species of *Asinus*, &c. All the members of the species *Caballus*, no matter how large or how small they may be, produce fertile offspring, but *Caballus* does not produce with *Asinus* offspring capable of further propagating. Mules do not propagate mules.

In breeding domestic animals and in attempting to form new kinds, it is important to clearly distinguish between genus and species with regard to goats and sheep. The question is by no means settled whether goats and sheep belong to the same species. Buffon professes to have frequently obtained offspring from male goats and female sheep; Schmalz mentions a certain flock of sheep in Poland descended from she-goats. According to the evidence on oath on the part of a shepherd, it appears that in the year 1871 a farmer named Bauer, living at Skludgewo, near Ostromeco, in Western Prussia, succeeded in obtaining six ram lambs out of twenty fine-woolled merino ewes that had been covered by a he-goat. To avoid any possible access of a ram to these ewes, they were kept away from the remainder of the sheep altogether. Many other authenticated instances are known of fertile crosses between goats and sheep. Several flocks of such sheep-goats or goat-sheep are known to exist in Chili at the present time. Some of them were imported to Germany, and are kept there at the present time.

Fertile crosses of roes and sheep are also known to have occurred, but their offspring died soon after their birth. It has been observed that animals obtained by such heterogenous crosses were frequently more or less defective in their reproductive organs. In the meantime, we may argue from the fact that fertile crosses do occur amongst members of different orders even, such as of deer and sheep, that amongst the ruminants, for instance, there still exists a certain relationship, and that the common ancestors of the ruminant order have existed during a comparatively recent period of the world's history. It is also worthy of notice that, during the process of evolution, a time arrived when certain groups of animals became so strongly differentiated in their internal organisation as to limit fertility.

Where nature has drawn the line, or, in other words, of what kind have been the modifications in the animal body to effect this, we do not know.

So much appears certain—namely, that, if each kind of our domestic animals were the result of a systematic creation for the special purpose for which it is now used, its type would have been very much more fixed at the time, and such fertile crosses as I mentioned would be impossible of creation. The possibility of producing offspring at all between goats and sheep, hares and rabbits, &c., speaks in favour of the probability that goats, sheep, antelopes, deer, &c., have sprung from the same ancestors, whose descendants have become differentiated.

The differentiation has become more and more complete, when those young animals, in whom a perfect amalgamation of the qualities of father and mother and a normal formation of the reproductive organs, had not taken place, did not survive.

The breeding of domestic animals for the purpose of obtaining more desirable animals thus chiefly consists in producing new varieties of the same species. Such new varieties should, firstly, possess the qualities we desire in a higher degree of perfection, and, secondly, transfer them wholly and perfectly to their offspring. It is clear that a breed of apparently good qualities is really of no value unless we can rely upon its perfections reappearing and becoming intensified in many generations to come. It is of interest to us to ascertain the reasons why some breeds of animals are so very variable—the horse and the dog, for instance—and others—the zebra, the wolf, the fox—are so tenaciously uniform in retaining the qualities of their ancestors. Considering the great difficulty of learning something definite about the natural laws according to which are regulated, on the one hand, the variability of our common domestic breeds, on the other that tenacity peculiar to wild races and to highly cultivated breeds, it is a remarkable fact that the most experienced and successful breeders of these and former times have entertained the notion that their results in breeding were not owing to fortuitous circumstances, or accidents, but that they were regulated by certain laws or necessities in the household of Nature. The most important ones of these laws had been agreed to, and were accepted by almost all successful breeders, long before they were eventually expressed in a scientific form, and handed to the world in the works of Darwin, Wallace, and other scientists. It is admitted by almost everyone acquainted with the phenomena in breeding, that the facts collected by Darwin in different parts of the globe during a period of about twenty years, have furnished the strongest scientific corroboration of the opinions held by the most successful breeders for more than 100 years.

I shall briefly describe Darwin's theory, and name a few facts which might illustrate the laws which, according to Darwin, have caused the origin of species, and which have still an effect upon the formation of any new variety that we may desire to establish.

Darwin believes that all animals and plants derive their descent from a few, perhaps only slight, organisms, and he has tried to show how the offspring of these comparatively imperfect beings have gradually developed into more perfect forms, and why the animals of the present day show so great a variety in form, qualities, temperament, and habits, &c. Darwin's theory is hardly calculated to assert itself in the minds of those who are only slightly acquainted with natural history and with the methods employed by naturalists in getting at results, and in the minds of those who entertain a strong reverence for the traditional. Yet there is no getting over facts, and, as Darwin has discovered and explained a great number of them, we are justified in accepting any reasonable explanation of them until a better one is given.

Darwin has shown that the development of low organisms into higher forms is chiefly due to—

1. Influences, telluric and climatic, that had a modifying effect on the living organisms.
2. To the struggle for existence, and the survival of the fittest.
3. Through natural selection, frequently carried on unconsciously.
4. Though certain habits and inclinations being strongly developea and transmitted to after generations.

If the surface of the earth had remained in its primitive condition, the forms of the animal and vegetable organisms then existing would be the same now as they were in the beginning, and in fact a good many of them are still preserved. Their variation would then have been comparatively slight, and their types would soon have become fixed. Changes in the surface of the earth, whether slow or violent, must have occasioned a great destruction of

plants and animals, and a comparatively small number of them survived—that is, those whose constitutions were fit to bear the changes of living to which they were now exposed. Not alone their own bodies, but much more those of their offspring, conceived and born when those changes took place, adapted themselves to the new conditions. Some alterations took place in their internal constitution as well as in their outer appearance. The results of geological researches have proved to us that changes like that have taken place at different periods, and this does not only account to a considerable extent for a great variety of form, but also for many a link in the chain of succession from lower to higher forms of development having been lost.

The present variety and perfection of animals can also be accounted for through the struggle for existence which pervades the whole vegetable and animal kingdom. We may convince ourselves every day that stronger and more perfect beings get the better of inferior ones, drive them as it were out of the field, deprive them of their means of existence, and are the instruments of their extinction, whilst the stronger ones, and the strongest again of their progeny, continue to exist and propagate.

A naturalist, travelling in Africa, observed how a small tribe of monkeys was completely tyrannised over by one male who happened to be stronger and bigger than the others. Whenever any other male attempted to approach a female, the big monkey attacked and punished him severely. Should the old monkey continue to live, the tribe would after a time be composed of his own offspring only. In such a case, the sire will cover his daughters, granddaughters, &c., until a son, stronger than himself, will beat him out of the field, exercise a similar tyranny, and run with females that are closely related to him. We have here not only a case of the best male surviving, but also an instance of in-and-in breeding, as practised by nature, with the result that every individual of the tribe must become exceedingly like to each other, not only in outer appearance, but also in organisation generally, and, as the descendants of the strongest, being exceedingly strong themselves.

Some varieties may also be preserved by quite accidental circumstances. Leaf-eating insects of greenish tints, for instance, have a better chance of avoiding discovery by their enemies than those whose bright colours serve to attract their destroyers. The same applies to birds and animals having colours similar to the places where they live—partridges, quails, larks, hares, are earth-coloured. The desire for reproducing their species is also as powerful an agent for development as the struggle for existence. Males struggle for the possession of females, either by combat, as in the case of the monkey just mentioned, and the systematic wars carried on by stages during the season, or by means of displaying before the females some advantages in form, in colour, in plumage. Males and females of indifferent qualities are in this way excluded from having offspring. It is evident also that such individuals chiefly become progenitors of offspring who, apart from having more perfect constitutions than others, exerted themselves in a higher degree to obtain sexual intercourse—*i.e.*, whose sexual organs are more perfectly developed.

Thousands and thousands of years have elapsed, during which plants and animals have existed and developed under the influence of the conditions we have just mentioned, and we are justified in supposing that the striking similarity of individuals of the same wild race, and the strong tendency of producing the almost identical characteristics of form, colour, temper, inclinations, and habits, is owing to those causes which we have mentioned. There is no evidence that they were produced by any other causes. The strongest, healthiest, most beautiful animals, both male and female, survived in that constant struggle for existence and sexual intercourse, the inferior ones perished. If we consider now that a comparatively short time would have been sufficient to overcrowd the earth and the ocean with living things if that struggle had not existed, we cannot help feeling that the wild races now extant owe their existence to the closest possible and successful competition for life and sexual

intercourse on the part of their ancestors. The wild deer that has just now triumphed over his antagonist can boast that he is the scion of thousands of ancestors as good as he is himself; of ancestors who have strongly, although unconsciously, cultivated the noble qualities through which he himself is distinguished, and have transferred them, a noble heirloom, to the child of the present era. There is another circumstance which must not be overlooked, and to which reference has already been made. It is at least probable that wild animals of the same locality are closely related to each other, and that to some extent in-breeding must have been carried on amongst them. The children of the same mother naturally keep about her even after they have arrived at maturity—a fact frequently noticed in flocks of sheep. The natural affection between a mother and her young is likely to last beyond the infancy of the latter, and if so, the chances are that mother, daughter, and granddaughter keep more or less closely together on the pasture and are mated by the same male. My own observations amongst sheep have certainly led me to think so, and I find my opinion backed by forest masters on the Continent, who are unanimous in asserting that wild deer keep together and depasture in clans. Nature has here foreshadowed to us two very important factors in breeding—namely, selection and in-breeding.

It would lead us too far away from the practical part of the subject, if I were to explain the other theories expounded by naturalists for the purpose of explaining the origin of the different species.

I may mention, however, that migration and isolation have, according to Wallace and other naturalists, contributed a good deal towards the differentiation of certain originally similar groups of animals into distinct species.

It stands to reason that, if certain animals leave their overcrowded pastures and locate themselves in new lands, two things will probably occur:—Firstly, the new conditions will exercise a modifying influence on the immigrants. Secondly, their sexual intercourse will be restricted to the now limited number of those that have emigrated together, and that are now under the same modifying influences. The joint effect of the new conditions and the limitation of the sexual intercourse will, after a lapse of time, more or less differentiate the animals in question from their original stock.

Such migrations of animals from overcrowded feeding grounds, as well as periodical migrations into more congenial climates, are not uncommon in nature. As instances of such isolations having taken place in early times, we have the fact that some animals and birds are peculiar to certain localities, such as the armadillo in South America, the marsupials in Australia, the apteryx in New Zealand, &c.

Wagner mentions a number of such cases in North Africa. The *Macroscelides Rozeli* has never been found east of the river Shelif. The small striped Barbary mouse (*mus Barbarus*) lives only on the eastern side of that river. A small ringed lizard (*Amphisboena Wiegmanni*), occurs in Oran only.

Such isolations may have been caused by volcanic actions, such as the raising and the sinking of land, &c., and consequently by the formation of new rivers, mountains, &c. These matters, however, though they may be interesting to the student of natural history, have only a secondary interest for the practical breeder.

In the foregoing explanations I have tried to show that—Firstly, the individual animals of the wild races now existing are exceedingly like to each other, and that no variations take place amongst them at the present time. Secondly, that this tendency of preserving the peculiarities with which the animals are now endowed is the result of certain agencies that have exercised their influence for a great number of years. So that these peculiarities of each race of animals have existed amongst them probably for thousands of years. Thirdly, that they have consequently become so strongly fixed that variations cannot take place, so long as the animals continue to live under the influence of those agencies that have produced them, and have caused their preservation.

It is therefore easily understood that, so soon as such animals are removed from those influences which were instrumental in fixing their types, the animals are likely to vary in different directions, according to the nature of the new conditions under which they are now living.

It is also clear that such variations in size, shape, colour, &c., will be increased so soon as the originally distinct types are no longer kept isolated, but allowed to merge into one another, or, in other words, the more they are intermixed with each other by interbreeding or by crossing.

Breeds of animals that transfer their peculiarities to their offspring without variation are called "constant races;" those that are subject to variations are variable or inconstant.

Just so constant in transmitting their qualities as are the wild animals, so constant is it possible to make a domestic race also, as I shall explain later on.

Amongst the domestic animals of the present day, variability is mostly the result of frequent crosses in different directions, quite apart from any changes of locality or food, &c., although the latter are likewise powerful agencies.

Constancy and variability are the two great factors that rule our success in breeding. If we wish to produce more desirable forms, our breeding material must have the properties of potter's clay: it must be pliable, soft, plastic. That means the forms of animals which we wish to improve must yield to our wishes; the qualities of male and female must amalgamate. Neither male nor female must persist in transmitting some less desirable qualities of some inferior ancestors. As soon as the desirable forms are obtained, we must try to fix them and accumulate them; that means we must increase the tendency of the animals to produce none but the desired qualities. In this respect they should behave like individuals of a wild race. Variability may be compared to the water and other agencies which soften and purify the clay; constancy to the fire that hardens it, and by so doing preserves the form into which the clay has been moulded. Naturally hard clay has to be softened first before it can be moulded, and after having received a new form it has then to be hardened again so that water cannot dissolve it again.

When the offspring of certain animals unmistakably show the qualities of either the father or the mother, we say that the offspring has inherited and the parents have transmitted them.

In some cases it is very difficult to tell whether the qualities which a flock of sheep, for instance, now possesses are the results of inheritance or of food and climate.

Those of my readers who can recall the days when our sheep were shepherded will remember the remarkable change in the wool so soon as sheep originally shepherded were put into paddocks. The wool became much longer and stronger. I mean to say that, whilst the paddock-grown wool had suffered somewhat in softness and elasticity, the diameter of the fibre had become longer, the wool looked coarser. I remember one particular instance—viz., the C. clip. Before the sheep went into the paddocks it was one of the best fine clothing wool clips in the colony. When the first clip of the paddock-fed sheep had been sold, the brokers inquired why the owner had gone in for so different a class of sheep than those that hitherto realised the good prices. The wool had grown so much longer and coarser on the sheep during the time of paddock-feeding that the clip appeared to come from a different stock of sheep altogether. Let us suppose now that a person wished to establish a breed of long-woolled sheep, and he were to select from these paddock-fed animals, whose ancestors had been for generations backwards famed for short and fine wool, would he be likely to succeed in obtaining a true combing wool breed out of them, particularly if they were shepherded again? Certainly not. If paddock-feeding were continued, the sheep would probably continue to carry long-stapled fleeces, but they would adopt their true short wool character as soon as they were put into flocks and herded.

The opposite thing might occur. I know of a ram coming from a fine-woolled *bonâ fide* combing wool flock of Tasmania, carrying a fleece of good

length and of medium fineness. He was taken to a station in the West of Queensland and put into a paddock, receiving very little artificial food, such as he had been accustomed to. The fleece grown during the first year, whilst he was in Queensland, showed all the characteristics of the Saxon sheep, his ancestors. The short grass and the dry climate had caused the reappearance of traces of the type of some of his ancestors, and it was considered advisable to select for him a class of ewes whose fleeces were calculated to counteract any shortness of staple which the animal might tend to transmit, descending as he originally did from a short-woolled flock, which had recently only been transformed into a longer stapled one, and now showing in his present home a tendency towards shortness of staple.

I have mentioned these cases merely to show how important it is to distinguish in a breed of animals between those qualities which are mainly the results of food and climate and those which are the genealogical property of the breed itself. Under ordinary circumstances, however, we must consider the appearance of by far the greater number of qualities as due to the fact that they are, good or bad, the heirloom of the family as transmitted from ancestors. A careful consideration of these matters is the principal condition of any success in breeding. Darwin gives the following explanation :— No breeder doubts how strong is the tendency of inheritance. Like produces like, is his fundamental belief ; doubts have been thrown on this principle by theoretical writers alone. When any deviation of structure often appears, and we see it in the father and the child, we cannot tell whether it may not be due to the same cause having acted on both ; but when amongst individuals apparently exposed to the same conditions, any very rare deviation, due to some extraordinary combinations of circumstances, appears in the parent, say, once amongst several million individuals, and it reappears in the child, the mere doctrine of chances almost compels us to attribute its reappearance to inheritance. Everyone must have heard of albinism, prickly skin, hairy bodies appearing in several members of the same family. If strange and rare deviations of structure are truly inherited, less strange and commoner deviations may be fairly admitted to be inheritable.

Perhaps the correct way of viewing the whole subject would be to look at the inheritance of every character whatever as a rule, and non-inheritance as an anomaly. The laws of inheritance are quite unknown, and it is very much to be regretted that physiologists have not yet been able to enlighten us on that point. The same ideas which led to the employment of the term "inheritance" produced also the expression "*blood*." It is as well to state here that the term "blood," as used by the breeders of domestic animals, has, with them, an entirely different meaning to what it has when used in the expression "blue blood."

There are still people to be met with who firmly believe that the sublime members of our so-called aristocracy are in possession of a superior or blue blood. In what respect the aristocratic blood should differ from the democratic, no physiologist has been able to make out yet ; and if a series of minute investigations should be instituted, the probabilities are that the blood of the good English yeoman will prove stronger and healthier than that of a son of the "Lord No Zoo."

The term "blood," as used in breeding, refers to a combination of several qualities which are valued either from a strictly practical point of view or as a matter of fancy.

A blood animal must first possess the desired qualities in a highly developed form, so as to be strongly distinguished by them from the ordinary run of animals ; secondly, it must be descended from ancestors that have been bred for a considerable time with the distinct aim of producing and developing the qualities in question ; thirdly, it must unfailingly transmit them under ordinary circumstances ; and, fourthly, blood animals must carry a certain family likeness, as a proof of common descent from a constant race.

Wherever these conditions are fulfilled, the animal's body must possess a great similarity in the organisation of all its parts—in all the parts of the brain, the bone, the muscles, &c. Also the fluids of the body with the cells, and other

organic matters which they contain, must be of the same type. And, as the blood is the medium through which every growth takes place, it is probably this idea which caused the term "blood" to be employed as that of the conveyor and propagator of everything which we desire to obtain and preserve in our domestic animals.

A blood animal must—Firstly, be excellent in every respect; secondly, the cultivation of the good qualities must continue; thirdly, they must have existed in the ancestors for many generations. The great German agriculturist and eminent sheep-breeder—founder of the first agricultural college in the world (1804)—Möglin, says: "With reference to domestic animals, I do not believe that the children have blood, or, what is the same thing, are highbred, because their parents were considered to be so. But I consider that the ancestors must have been superior, if their progeny are excellent in every respect: *Fortes creantur ex fortibus et bonis*—the brave cannot descend but from the brave and good."

Instead of using the term "blood" we frequently speak of constant animals. Constancy, like blood, depends upon the exceedingly frequent occurrence of the desired qualities in several generations back. A breed that has attained to the highest degree of constancy is called "consolidated." It may fairly be supposed that the influence of either parent on the offspring is equal, provided that either of them has the same degree of constancy. If the case should prove different, we must naturally suspect that the animal whose qualities have shown themselves victorious over the other must have descended from parents of greater constancy. This occurs most frequently with males, because we generally employ sires from breeds of better stock.

Some animals do not possess the same inheriting power as others, quite apart from the degree of constancy prevalent amongst the stock whence they came. Amongst several animals of exactly the same descent in every respect, we occasionally find an individual of less promising appearance to be by far the better stock-getter than better-looking ones, and that not alone his children, but also his grand and great-grand children, are far superior to those of his brothers. This may be owing to an individual power of inheritance distinct from the general inheriting tendency of the breed in question. Greater sexual impulse may account for it, yet we have to look to the physiologists for scientific explanation of this and similar facts. Practical breeders have begun to pay special attention to this "individual power of inheritance," or "prepotency," which some animals possess in a higher degree than others—a subject to which we shall return on a later occasion.

Some qualities are easier transferred and more thoroughly fixed than others. Generally there is no difficulty in producing a regularly waved staple, softness, and elasticity; on the other hand, it is most difficult to secure the transfer of density of growth and evenness in the fleece. We may also rely on the father transferring the qualities of the fleece, and have to look to the mother for shape and carcass.

PIG MEMS.

PIGS are rendered more liable to disease than any other domestic animal on the farm or station. This is solely the fault of their owners. One of the best means for breeding the *suis bacillus* is decaying organic matter, generating heat, and consequent fermentation. The place of all others where decaying vegetable and animal matter are to be found is the old-fashioned farm log pigsty. This mass of uncleanliness is the result of the careless method of feeding the pigs, and the second result is that here are bred swarms of bacilli which will preserve their vitality in it until they find a suitable medium, such as the pig, in which to nidify and propagate their nefarious brood. Keep the sty clean and dry, therefore, if you want healthy pigs.

Wheat makes good feed for pigs if it is first steamed or boiled. When wheat gets below a certain price, then it will pay the farmer to turn it into bacon and ham.

Pigs will always thrive better where they have a grass run than where they are shut up all their short lives in a narrow sty.

Always take care to have some charcoal lying about where the pigs can get at it. Pigs suffer from acidity of the stomach in the same manner as human beings do, and charcoal has the effect of correcting the acidity.

There are many little things which do not cost much that ought to be carefully attended to in the rearing of pigs and making of pork. Whatever contributes to the comfort and health of the animals should never be overlooked or neglected. They should have clean, dry quarters, cool and comfortable in summer and warm in winter. Without such shelter, they cannot get a sufficiency of pure, life-giving air to maintain health and stimulate growth. Their food must be clean, sweet, and wholesome, and a supply of pure water to drink is indispensable. Some dry concentrated food in summer and succulent food in winter are necessary, if the best results are to be produced. A mixture of charcoal, sulphur, ashes, and salt—always accessible to pigs—will be found efficient in conserving and promoting health. One who never tried it will be surprised at the amount of such mixture which a pig will eat. Then fine and coarse food should be duly mixed, not only to nourish the body, but to keep the digestive organs in good condition and the bowels open.

SOWS THAT WILL NOT BREED.

Says "Theodore Lewis":—"Someone may have non-breeding sows that will not become impregnated. Give them daily a gill of fine ground hemp-seed, in dry meal of corn and shorts, or ground feed."

"No peach-fed pork sold here," was a notice posted in a New York provision store some time ago. The hogs which fed on fallen peaches in the large orchards developed an enormous amount of yellowish fat. The public do not want pigs bred for lard. What they want is bacon, nice streaky alternations of fat and lean; so the demand now is for leaner pork. The pigs generally bred in Queensland supply this demand to perfection. It is not so much the pig as the pig-feeder who is to blame for an excess of fat. To produce good bacon, a pig should not be a corn-fed animal. Corn is good to "top up" with. Skim milk and bran, whey, and the waste of the flour-mills, with as much green food and roots as they can eat, are good for producing a bacon and ham which will meet the public taste. If ham is sold at 1s. per lb., and half of it is fat, which people cannot eat, then that ham costs the consumer 2s. per lb., and is therefore dear at the price.

A pig can be so fed as to put on 1 lb. of flesh per day.

Some people have an idea that a pig should always be eating, but a pig can be overfed. Keep the animal and its trough clean, give it plenty of fresh water, and feed judiciously. The pig will lay on weight quite fast enough.

Should the sow carry her pigs beyond the usual period of gestation, it frequently happens that the piglings' teeth will have made an abnormal growth, and in some instances the teeth will have become discoloured to an extent which has led to the common saying that "pigs born with black teeth never do well." These little teeth are often very long and very sharp, so that, when the little pigs attempt to suck, the teeth extend beyond the tongue of the pig and prick the inflamed and tender udder of the sow, giving her great pain, which frequently causes her to refuse to suckle the pigs, and sometimes she will attack the little ones with open mouth, when one grab from her powerful jaws seriously injures, if it does not at once kill, the youngster. Unless immediate steps are taken to remove the cause of this trouble, the pigs soon die for want of food, and the sow's udder becomes distended with milk and inflammation of it follows.

THE REMEDY.

This is simple, and easily applied by the attendant on the sow. He takes up each pig, tucks it under his left arm, opens its mouth with is left hand, and with his right hand and a small pair of pincers he breaks off the erring teeth and then places the pig to the sow. Then by a little of both coaxing and scratching the sow will turn on her side; the little pigs, being unable to bite the udder and each other, will quickly relieve the distended udder of the sow, and prove a source of pleasure to her instead of an irritant and a cause of pain. Sometimes the sow will become impatient on hearing the shrieks of her little pigs whilst the operation of dentistry is progressing; if this does affect her, it is best to take the little pigs into an adjoining place out of hearing of the sow.

It has been found that pigs which are washed put on a fifth more flesh than those that are unwashed.

If sick pigs have been wandering about in a field or have died in it, it is unwise to put healthy animals into the same field, as it cannot be disinfected except by process of time or by cultivation.

The Horse.

STABLE NOTES, No. 2.

By W. C. QUINNELL, M.R.C.V.S.

DISEASES OF THE HORSE.

GENERAL EXTERNAL SYMPTOMS.

THE healthy and unhealthy state of the skin is very readily shown by the appearance of the hair or the so-called *coat* of the lower animals. When the skin is in a morbid state, the coat is always *harsh* and *dry;* these signs enable us to arrive at the true cause of these abnormal changes.

For instance, a *dry, scurvy appearance* of the skin is an indication of digestive disturbance, such as indigestion. Again, the condition known as *Hide-bound* arises from want of proper food and exercise, and is very often caused by *internal* parasites—*i.e.*, round, thread, and tape worms—which so frequently infest domesticated animals.

Shivers or Rigors, when persistent, are a forerunner of fever.

Continuous Coldness of the extremities and general surface of the body of an animal denote severe inflammatory disease and enfeebled heart.

In regard to other external signs of impaired health, I may mention departure from ordinary habits, such as loss of appetite, dulness; an unthrifty appearance; alteration in gait and behaviour; and the condition of the urine and fæces are rougher methods of diagnosis. Regarding the two latter, any deviation from the normal state can only be appreciated after being quite familiar with the healthy appearance of the excreta.

GENERAL TREATMENT OF HORSES IN DISEASE.

Nursing is the first and most important consideration in the treatment of a sick or injured horse, and when intelligently understood conduces greatly to the hasty restoration of most animals.

The details of nursing consist in the kind prompt attention to the animal's comfort and strict observation to such matters as food, surroundings, bedding, or application of medicaments, and other minute wants and needs of an animal in ill-health. It is impossible to lay down any exact rules for good nursing, but we hope to give some general rules which may be useful in the treatment of patients.

Loose Boxes and Rests.—A sick or exhausted horse, who to his disadvantage would continue to stand if kept tied in a stall, will often at once lie down and rest if placed in a well-bedded comfortable box. Tying up of sick animals should be avoided as much as possible; he should be free to move about or lie down as he may prefer.

Physiological rest is a great restorative.

The pain accompanying most injuries and disease, and greatly aggravated by performance of the natural functions of the part, instinctively enjoins as much rest as possible. For instance, a horse with injured limb would be placed in slings; in a case of bowel complaint, the simplest and most digestible food is given, so as to exact as little duty as possible from the stomach and bowels.

Temperature and Ventilation.—The stable or loose box having a temperature of 60 degrees to 65 degrees Fahr. is sufficiently warm for a sick animal.

In cold weather, and especially if the animal is suffering from disease of the respiratory tract, the temperature given above should be maintained by artificial means.

Warmth of the Body.—In febrile and inflammatory attacks and during recovery from exhausting disease, alike in horse and cattle, a *warm rug* or two, and *bandages* to the legs, help to maintain equal temperature and combat congestion of internal organs; but at least twice daily these rugs and bandages should be stripped off, the skin wisped over, and the clothing at once reapplied.

Removal of Shoes.—In cases where fever or inflammation are present, ease and comfort will be afforded to the patient by the removal of the shoes, excepting when horses have flat or pumiced or weak feet.

HINTS ON HORSES.

Never use a collar that is too large. A horse will be more injured by a collar too large for him than by one that is too small.

Always keep a working horse in good condition. If he once gets low, it takes much time to bring him up to proper condition again.

Well-oiled harness laughs and refuses to grow old.

To be in a healthy condition a horse must be able to perspire freely. Unless the skin is kept clean he cannot do this. Hence the necessity of regular and thorough grooming.

What shall we do with the old horses? Work them until they cease to be profitable, and then bury them on the farm. Do not offend every sense of gratitude and humanity by turning them out to die by inches, or by selling them into slavery and abuse for a few shillings.

There are 2 quarts of oats in the currycomb and 4 in the brush.

Poultry.

THE POULTRY BUG OR TICK.

No. 2.

By MRS. LANCE RAWSON.

SOME 7 or 8 years ago, I was driven out to look at some turkeys that were supposed to be suffering from some mysterious disease new to their owner, who was a very old man living quite alone. He had up to that year done a good thing with his turkeys, and at this time he had quite a large flock of young birds. The place was indescribably dirty—the fowlhouse, a lean-to or skillion on to the stable, had evidently *never* been cleaned during the 10 years he had

lived there, the droppings almost blocking up the whole space right up to the roosts. The unfortunate turkeys were in a deplorable condition, being positively alive with what the men took to be large lice. I had never seen anything like them; they were nearly as long as my finger-nail, of a grey colour, and the smaller ones were soft, but when older and full grown they had a hard shell. Now I feel convinced that they were the so-called poultry tick. Three or four of the birds I personally examined had bunches and clusters of nits under the wings, in the hollows of the shoulders, and on the side of the legs, and they had even worked under the skin and were in little blobs or cists, which burst when squeezed, and let a swarm of horrible, wicked-looking slimy lice free. I had never seen or heard of anything like it before, nor have I since, and my advice to the old man was to kill and burn every feather, as well as the house. Naturally, he demurred at this, and explained that one lot of thirteen young birds were not so bad. So I then suggested fumigating them with sulphur in a close box, and by way of showing him how to do it I assisted with a couple of the birds. The box we used was old and full of cracks, and well-nigh useless for keeping the fumes in, but, bad as it was, the fumigating, even in such a manner, was a revelation. Before the turkey was half the 7 minutes in the fumes the box was literally and absolutely a mass of swarming vermin of all sizes, varieties, and conditions, proving that the birds could be cleansed with a little trouble. How many he actually did save I never heard, but I was told that he killed and burned the greater part of his flock as being too far gone to be worth treating. This is the treatment I would advise, now, for each bird. It will be far and away superior to any dip, and especially if sulphur be also given to the fowls in their food two or three times a week. A close box—if possible, one that is made of tongued and grooved boards—is necessary for fumigating purposes; a butter box is the very thing if it can be got large enough, yet *not too* large, for the hen should not be able to turn round. She should just fit in, and a piece must be cut out, a groove in fact, for the head to come through; and to prevent it being drawn in, make a large circular collar of cardboard with a cut out to the edge, so that it can be twisted round the neck; then when the lid is put on all you see of the hen is her head emerging from the side of the box. To hold the hot coals and sulphur, an old saucer, or jam tin cut down, is best, and it must be placed just behind the hen. I had a box made for fumigating my setting hens to rid them of vermin, and, instead of using a jam tin for the hot ashes, I had a small tin sunk in the bottom of the box in the right place, and when the hot coals were put in, and the spoonful of sulphur on them, a perforated cover fitted over, and there was no danger of the hen kicking the ashes about. It was a most excellent idea, and worked splendidly. From 5 to 7 minutes is the time I allow each hen, and before releasing her remove the collar, and let her draw her head in for a minute or two. I have seen the lice swarm *to* the head till the hen was almost blind and mad with them, but, as a rule, they are overcome before they get so far as the head. For the poultry bug or tick it is likely that the hens will want doing more than once, but, if sulphur be given them in their food as well, I should say three fumigations (at the outside), and probably only two, would effectually get rid of the pests. It has been proved that sulphur, when the cows can be induced to take it, goes a long way towards ridding them of the cattle tick; so it is worth trying for the fowls. If fumigating does not destroy this pest, I do not know what will; *certainly* I would *not* advise dipping; once you grease, smear, or saturate a fowl's feathers with any foreign compound, you interfere with her health. I have seen it done to get rid of vermin, and I have seen the birds mope about day after day, losing flesh and dwindling away to skin and bone. Her own animal oil—a supply of which every hen carries in her oil-bag—is the only oil that should go near her feathers. Sulphur fumes, if rightly applied, will destroy all parasites far more effectually than any dip. One writer recommends kerosene, or kerosene and salad oil, applied with a rag to those parts where the eggs are. *I would not use it*, nor advise any one else to; the only way it is excusable, or even necessary, is mixed with salad oil and about 6

drops of creosote (oil of tar) that is in a good-sized bottle, then applied with a feather or camel's hair brush to the top of the head and under the wings; this is done mostly with chickens when the large louse, misnamed the "chicken tick," is suspected. They are said to cause the death of many young chickens in parts of New South Wales; but though I have frequently found them in Queensland on old and sick fowls, I never saw them on chickens. They greatly resemble the louse found on wild fowl and on wallabies, though a little smaller than the latter.—*Australian Tropiculturist.*

EGGS AS FOOD.

SIX large eggs will weigh about 1 lb. As a flesh producer, 1 lb. of eggs is equal to 1 lb. of beef. About one-third of the weight of an egg is solid nutriment, which is more than can be said of meat. There are no bones and tough pieces that have to be laid aside. Practically, an egg is animal food, and yet there is none of the disagreeable work of the butcher necessary to obtain it.

IS POULTRY-FARMING A SUCCESS?

THERE is much controversy on the question of poultry-farming pure and simple. We have endeavoured on more than one occasion to show that the keeping of good, well-bred poultry on a farm is a source of considerable profit, but we have yet to hear that any attempt at poultry-farming as a separate business has been successful in any part of Queensland. Many have tried it, but all appear to have failed. There must be substantial reason for such failure. A contributor to *Home and Farm* holds the opinion that poultry-keeping on a large scale *will* pay. He says:—What is to prevent the farmer increasing the capital invested in poultry just as he increases the capital invested in pigs, cattle, farm machinery, and everything else that is followed on the farm? Supposing that he raises 300 or 400 hens, if he does not care to go into it more largely. There is not a farmer who cannot raise 400 hens, and maintain and keep them upon his farm without any serious neglect to the other branches of his farm interests. If he should raise enough to devote his entire time to it, it would probably pay him better than anything else he could engage in. There is not a farmer who cannot raise 400 laying hens, and maintain them throught the year by proper care and managment, having his hen-houses scattered around in different places, and they should turn him out a profit of about £80. This result can be achieved by letting the fowls go entirely as they please, but with a comparatively limited amount of care and attention these figures can be reached. You have nothing else on the farm that will pay the same figures on the amount invested, and by the same care and attention.

Again, we find contrary opinions held by experts in the old country.

The *Agricultural Gazette*, London, publishes a letter from Mr. W. B. Tegetmeier, who denounces poultry farms not only as failures, but as actually non-existent in Great Britain, Ireland, France, or Belgium. On the other hand, another authority, Mr. K. B. De La Bere, publishes figures which go to show that by keeping poultry in large numbers a profit may be made, whilst by keeping some 20 head a profit of 10s. 1d. per head per annum can be made.

Mr. Tegetmeier, under the head of "Poultry in Large Numbers," says:—In reply to a query in your last on keeping poultry in large numbers, there is inserted a very remarkable answer. In the first place, it is stated that the system of keeping fowls in large numbers upon ground which is rented for this object alone is to be deprecated, and that its success would be doubtful. The writer of this reply states that he does not know of any case where it has been profitable, and that poultry-farming must be combined with something else to ensure success. With these statements I perfectly agree. I have been for half a

century interested in profitable poultry-keeping, and have searched Great Britain and Ireland, to say nothing of France and Belgium, in vain for what is regarded as a poultry farm. After making these statements, however, the writer's replies to the questions appear perfectly contradictory. He advises on the district which should be selected for poultry-farming, but if poultry farms are failures why advise the selection of any land for carrying them out? He then gives further advice on the breeds that are to be used in poultry-farming, but if it does not succeed as he says in the first part of his article, why enter into a selection of birds either for table fowl or of fanciers' breeds for laying? He next states that 1,000 birds could be kept on 10 acres of land or even less. I should like very much to see the balance-sheet of an establishment of the kind, and I am willing to go to any part of England to see one which has been in successful operation for any small number of years. The writer proceeds on the assumption that such a thing can be satisfactorily conducted, but says he would not advise "Reader" to venture unless he has £500 available. Can he inform me where I can find a man who has begun with £500 or 1,000 hens on 10 acres of land who has not lost his money, or continues his farm? I have known myself of scores of poultry farms being attempted in England, but I have never known one that has ever approached success. The causes are not far to seek to those who choose to look for them. What are called and advertised as poultry farms in England are simply establishments where fancy poultry and eggs are sold at fancy prices—the great majority being bought, not bred, for the purpose. I ask, and have for years asked in vain, Where is there a successful poultry farm? Their produce is not known in the markets to where the birds are sent not by the farmers but by the fatteners. The advising anyone to start such an establishment is, to say the least, unsatisfactory.

Mr. De La Bere writes:—

THE NATIONAL POULTRY TEST.

It will be in the recollection of most agriculturists and other poultry-keepers that the above test commenced on 1st March, 1898, and closed on the first of this month. As considerably over one million prints of the test circular were distributed through the post and press columns, it is hoped that a large number of results will come to hand during the next week or two, and which I hope to tabulate and publish later on. As considerable public interest and expectation exists as to these returns, perhaps you will allow me to give particulars of the first received, as it will be of special interest to poultry-keepers who are obliged to restrict the range of their poultry to very narrow limits.

The success obtained by the flock of fowls in this return confirms the last paragraph of the poultry test circular, in which I said, "My thirty years' experience in poultry-keeping leads me to believe that results will be forthcoming from these tests calculated to both astonish and impress."

GLOUCESTERSHIRE.—Results obtained from 1st March, 1898, to 1st March, 1899, from twenty hens confined within a yard, 36 yards by 16. Yield of eggs:—March, 424; April, 446; May, 441; June, 444; July, 372; August, 308; September, 236; October, 182; November, 200; December, 143; January, 222; February, 291—total, 3,709.

Dr.	£ s. d.	Cr.	£ s. d.
To 20 hens at 3s. each	3 0 0	By 20 hens at 2s. 6d.	2 10 0
Poultry-house, 30s.; appliances, 10s.	2 0 0	10 pullets reared at 3s.	1 10 0
		8 cockerels at 2s....	0 16 0
5 per cent. interest on capital ...	0 5 0	3,709 eggs at 1s. per dozen ...	15 9 1
Cost of corn and meal	4 11 0	Manure at 18d. per head ...	1 10 0
Green food	0 5 0		
Two sittings of eggs	0 2 0		21 15 1
Labour at 3½ hours per week ..	1 10 4	Contra	11 13 4
	£11 13 4	Profit, 10s. 1d. per head ...	£10 1 9

Note.—As it is necessary that certain items should be common to each balance-sheet, to fairly compare one return with another, I have fixed the price of each flock of fowls subjected to the test as though they were purchased in at

3s. per head at the start, and sold out at 2s. 6d. at the close of the year. I also fix a common price for roosting the fowls in a wooden house at 30s. for 20 head, or £2 for 40 head, and the value of the manure at 18d. per head, or £1 10s. per ton. The labour question is also dealt with upon the same lines. Attendance on each field poultry-house at a distance from home six hours per week, and homestead houses at three and a half-hours. Lads' wages, 11s. per week. The above prices are as fair an average as it is possible to fix, to compare the true merits of the different birds tested and profits realised.

The somewhat high average price obtained from the above yield of eggs is accounted for by the facts (1) close proximity to a town market; (2) large size of eggs; (3) large number laid through the winter months. The cost of purchased food, it will be seen, is returned at about 1d. per head per week, but this was augmented by certain kitchen refuse which would have been otherwise wasted. This scrap refuse from a family of six no doubt much conduced to the laying properties of the flock, which attained the high average of 170 eggs per head, and this, after deducting 300 eggs as the estimated yield of the ten pullets reared, and which laid through the winter.

I trust that the highly satisfactory profit of 10s. 1d. per head shown by this return will encourage many poultry-keepers to forward me their balance-sheet, although they may not have kept their stock strictly upon the poultry test rules.

P.S.—The accuracy of the above return may be relied on. The eggs were recorded daily, and the invoices of food purchased carefully filed. Let me, however, warn enthusiasts who, after reading the above, think that by setting up 20 hens they may attain equal success. This may be possible, but is highly improbable. A profit of 5s. per head is seldom exceeded with flocks of 40 head, although 8s. per head is often realised where only a dozen or so are kept under favourable circumstances.

Now, whether a poultry farm on a large scale will pay or not, we have evidence of the remarkable success of a duck farm at Botany, Sydney. Those who have visited Botany will recollect that there much of the land is sandy and covered with patches of low scrub. It is on such a site that the duck farm is situated. Although only started three or four years ago, the annual output of ducks reaches to somewhere about 14,000, and has, we understand, proved to be a very remunerative business. The land is divided into paddocks and yards, of which latter there are several suited to the various conditions of the business. In one are collected vast numbers of ducks, whose business is egg-laying. The breeding ducks have a quiet yard to themselves, whilst the quarrelsome Muscoveys live and breed and fight in a spot quite apart from the rest. There are many small yards provided for hens which are employed in hatching out ducks' eggs. Fifteen incubators are also kept constantly going, and of course "mothers" have to be provided for the young ducklings from the incubator. These "mothers" can accommodate some 400 ducklings. From 8,000 to 10,000 eggs are sent to market every week in addition to those which are "set." The food of the birds consists of greenstuff, bran, pollard, wheat, and boiled liver. The export trade is restricted to Aylesburys, which fetch larger prices in the London market than Muscoveys. No attempt at starting such a farm has, we believe, as yet been made in Queensland.

SUCCESSFUL COMMERCIAL EGG PRODUCTION.

Referring again to the report of a year's work of 20 hens kept under test conditions (says the *Scottish Farmer*), the particulars are well worthy of very careful and extended perusal. In striking the balance of profit and loss, we think that Mr. De La Bere has erred in some particulars, both for and against the fowls. Take, for instance, the charges for poultry-houses and appliances. It seems to us unfair that the whole cost of 30s. and 10s. should be charged against the one year's work (if the whole cost is entered), without giving any

credit to the hens for the value of the house and appliances at the end of the year. Further, whilst we consider that the charge of 3s. each for 20 young hens just on the point of laying is quite a fair valuation, the crediting of the same hens at 2s. 6d. each after a year's work is, we consider, too high by at least 6d. per head. Then the charge for attendance is decidedly open to question; but the good points in the balance-sheet, with Mr. De La Bere's remarks, decidedly outweigh any defects. We wish to specially draw attention to the splendid average of eggs per hen—170. Whilst the price obtained is always largely ruled by the district in which the poultry-keeper may reside, as well as the price that can be got for the birds, the hard fact of 170 eggs per head remains a capital starting point, and it is a fact that anyone can use. It is evident that Mr. De La Bere's views have been slightly toned down regarding the average numbers of eggs, or, in other words, the best number of hens to be kept in one enclosure, as he hastens to warn his readers, as pointed out above, not to expect that 40 hens would give the same average number of eggs as 20. It is somewhat strange that, as the number of hens increases, the average number of eggs per hen steadily decreases, even though they may apparently be fed with an abundance of suitable food. We can quite easily understand the great advantage a generous amount of kitchen refuse may be to a small number of fowls; but why it should not be possible to feed in such a manner as to make a fairly large number do nearly as well as a small one, we have never yet been able to fully understand, but it remains a fact that hitherto all the large egg averages have been produced by small numbers of fowls. At one time Mr. De La Bere seemed to consider that 50 fowls could be profitably kept in one house, but he now recommends 20 as a more profitable lot. It really, however, is entirely dependent on the kind of outrun they may have as to how many can be profitably kept in one flock. We have kept as many as 200 in one lot, that had the range of a set of farm buildings and an unrestrained run of pasture, and kept all in perfect health. We also draw attention to the valuation put on their manure. We have before pointed out that we consider that that is all needed to pay for the grass they eat. Those who vote fowls only a nuisance, will do well to study the balance-sheet, and then ask themselves what other live stock they have ever had left the same amount of profit from such a small outlay.

THE WYANDOTTE AND LANGSHAN COMPARED.

A WRITER thus compares the Wyandotte and Langshan:—

The following comparison of them, with another of late very much praised breed, will be illustrative. The two breeds were in one hatch, and, of course, had, in every way, the same care and attention:—

WYANDOTTE. Weeks.	Oz.	LANGSHAN. Weeks.	Oz.
Age 4	8	Age 4	8
,, 8	24	,, 8	22
,, 10	32	,, 10	28
,, 12	40	,, 12	38
,, 14	52	,, 14	50
,, 16	64	,, 16	64
,, 18	72	,, 18	74

The birds were carefully weighed each week with the above result. It will be seen that the Wyandottes kept the lead up to 14 weeks old, the Langshans overtaking them at 16 weeks, when they scaled 4 lb. each. However, although both breeds up to that age gave equal results for their food and attention, such equality was more apparent than real, for while the 16 weeks' old Wyandottes were plump, cobby chickens, with plenty of breast meat, and quite fit for either

the local or home market, the Langshans were a bigger-bodied and more lanky fowl, although scaling the same. They were to this time but making bone, muscle, and frame on which to carry the big quantity of meat expected on them at 6 to 8 months old.

POULTRY FOOD.

There is a great similarity between the various poultry-powders and foods. The powders are popularly supposed to increase the egg-laying powers of hens. The following are a few typical formulas:—Powdered eggshell, or phosphate of lime, 4 oz.; iron sulphate, 4 oz.; powdered capsicum, 4 oz.; powdered fenugreek, 2 oz.; powdered black pepper, 1 oz.; silver sand, 2 oz.; powdered lentils, 6 oz. A tablespoonful to be mixed with sufficient food for 20 hens. Oystershell—ground—5 oz.; magnesia, 1 oz.; calcium carbonate, 3 oz.; bone—ground—1½ oz.; mustard bran, 1½ oz.; capsicum, 1 oz.; sodium chloride, 1 oz.; iron sulphate, ½-oz.; sodium carbonate, ½-oz.; sulphate, ½-oz.; beef—lean, dried, and powdered—10 oz.; fine sand, 10 oz.; corn meal, 20 oz.; linseed meal, 20 oz. Reduce all to moderately coarse powder and mix well. The above are formulas that are recommended by poultrymen, and are based upon practical experience in poultry-feeding, not upon the theoretical knowledge of pharmacists.

Indian corn will fatten geese quickest, but it makes the fat very yellow; and when the bird is put before the fire to roast, an undue amount of it becomes goose-greese. Oats are much better. They may be given crushed or whole. The former is the better; and a barley-meal and oat fattened goose is always a heavy-weighing, firm, well-flavoured bird.

The Orchard.

The results of experiments in cyaniding oranges which are published in this issue of the *Journal* are deserving of the thoughtful attention of every orchardist. In conjunction with Mr. H. Tryon, Entomologist, Mr. A. H. Benson has brought to an issue an exhaustive series of experiments having for their object to determine the strength of hydrocyanic gas requisite to effectually destroy scale insects on citrus fruits, and what is also of great importance to consumers, the effect of the gas on the fruit at various stages. The oranges chosen for these experiments were subjected to careful examination before being operated upon with gas to determine the percentage of living scale on them, and after being treated they were, at the expiration of 10 days, examined microscopically and the results tabulated, as will be seen in the article supplied to us by Messrs. Benson and Tryon.

The general results of the experiments have been summarised to show that hydrocyanic acid absolutely destroys all scale insects in every stage of their existence; that scrubbing the fruit to remove them is highly injurious to it, causing discolouration followed by decay; that water sprinkled on the skin will absorb the stronger gas, and blemish that portion of the fruit; and that generally the results show that the fruit—the *skins* of the fruit—should be dried before treatment by sweating; and, further, that cyaniding should not be carried on when the skin is full of sap or in rainy weather, and, *inter alia*, the fruit, if so badly infected as to be unsaleable without being scrubbed, should be cyanided first and scrubbed afterwards.

A perusal, however, of the article on the subject will throw much light upon the value of the process. Mr. Benson has thrown himself heart and soul into the business of destroying the scale insects on citrus fruits, in addition to carrying out his other onerous duties as instructor in fruit culture; and in this joint attack on the pests by Mr. Tryon and himself, we are sure that he will be found to have thrown so much light on the subject as to materially lessen the troubles of fruit-growers, who need only avail themselves of the assistance readily extended by the Department of Agriculture through the medium of the experts to eventually overcome, or at least minimise, the evil effects of insect fruit pests of all kinds.

EXPERIMENTS IN CYANIDING ORANGES.

By ALBERT H. BENSON AND HENRY TRYON.

ALL citrus fruits infested by scale insects that are exported from Queensland to the southern colonies having to be treated by hydrocyanic acid gas prior to shipment, we have carried out the following experiments in order to definitely determine—

First.—The strength of hydrocyanic acid gas that is required to destroy scale insects on citrus fruits.

Second.—The effect of hydrocyanic acid gas on the fruit when used at different strengths and under different conditions.

The experiments have been conducted by us in an airtight cyaniding chamber at the offices of the Department of Agriculture, said chamber having a capacity of 140 cubic feet.

In all of the experiments the fruit was exposed to the action of the gas for one hour, and the chamber being wholly unoccupied, save for the presence of the nine oranges used in each group of experiments, both the fruit and the insects attached to it were in each case subjected to this unimpaired.

The oranges experimented upon averaged about 3 inches in diameter, and had a fairly rough skin varying from one-fifth to one-sixth of an inch in thickness, and were grown by Mr. S. Voller at Enoggera, near Brisbane, on trees in full bearing. The soil of Mr. Voller's orchard is a porous, disintegrated granite that has been heavily manured with butchers' offal, and the trees were in vigorous health, though slightly suffering from the dry weather. The skins of the fruit were moderately dry and tough, the fruit being gathered on the day previous to that on which the experiments were carried out.

They were badly infested with *Aspidiotus ficus* (Circular Black Scale), *Chionaspis citri* (White Scale), and *Mytilaspis Gloveri* (Glover Scale).

In each group of experiments one-third of the fruit was left untouched, one-third of the fruit was dry-scrubbed with an ordinary scrubbing-brush to remove the scales, and the remaining third was sprinkled with water, but had no scales removed. Dry scrubbing of scale-infested fruit prior to marketing is often resorted to by our growers, and we were anxious to see the amount of injury in fumigating fruit traceable thereto. By the application of water a wet condition of the fruit was produced similar to that often exhibited by such as has been packed immediately after being gathered.

In carrying out the experiments Groups I. to V., the gas was generated by using the materials in the following proportions, viz.:—

Cyanide of potassium, 98 per cent. ...	1 oz. avoirdupois.
Sulphuric acid, "commercial"	1 fluid oz.
Water	3 fluid oz.

But in Group VI. the following proportion was used:—

Cyanide of potassium, 98 per cent. ...	1 oz. avoirdupois.
Sulphuric acid, "commercial"	5 fluid oz.
Water	10 fluid oz.

This latter being the proportion given in the Regulation of Diseases in Plants Act dealing with the cyaniding of fruit for export.

After being treated, the fruit was carefully wrapped in tissue paper, and at the end of 10 days was examined microscopically, the result of the examination of the various lots being shown in detail in the tabulated statement herewith.

In order to render the experiments as complete as possible, and to be able to compare results, a sample of fruit was carefully examined before treatment, and the percentage of living scales of different kinds determined.

The general results of the experiments may be summarised as follows:—

First.—That hydrocyanic acid gas, even in a very dilute state, and employed under conditions similar to those obtaining in experiments under review, absolutely destroys all the scale insects mentioned, whether in the mature or larval state, when they are confined in it for the period of one hour. And that the same is apparently true, for the eggs of at least two of them—*i.e.*, White Scale (*Chionaspis citri*), and Circular Black Scale (*Aspidiotus ficus*).

Second.—That dry-scrubbing the fruit to remove scale insects may injure the skin to such an extent that the gas acts much more readily on it, causing more or less discolouration followed by decay, especially when it is strong.

Third.—That drops of water on the skin of the fruit tend to absorb the gas when used at the greater strengths, and to blemish those portions of the skin covered by them.

Fourth.—That it is not necessary to use 5 fluid oz. of sulphuric acid and 10 fluid oz. of water to generate the gas from 1 oz. of 98 per cent. cyanide of potassium. Moreover, theoretically this is six times the quantity of acid indicated by the chemical action involved in generating the gas.

These results, therefore show the advisability of—

First.—Drying the skins of the fruit by sweating before treatment.

Second.—Doing away with dry scrubbing prior to treatment; and in the case where fruit is so badly infested as to be unsaleable without being scrubbed, that the fruit be cyanided first and scrubbed afterwards.

Third.—Not cyaniding the fruit when the skin is full of sap or covered with rain drops.

Fourth.—Reducing the strength of the gas from that generated by 1 oz. cyanide of potassium, 5 fluid oz. of sulphuric acid, and 10 fluid oz. of water, to 150 cubic feet of space, to that of the gas generated by 1 oz. cyanide of potassium, 1 fluid oz. sulphuric acid, and 3 fluid oz. of water to 300 cubic feet of space.

These remarks refer particularly to unwrapped fruit infested with the scale insects mentioned, packed in open cases or laid on trays, such fruit being treated in an airtight chamber.

When cyaniding the fruit or trees in an orchard, there is always more or less loss, so that it is not advisable to use less than 1 oz. of cyanide of potassium to 300 cubic feet of space, and in some instances it is advisable to increase this amount somewhat.

CONDITION OF FRUIT AS REGARDS VITALITY OF INSECTS PRESENT PRIOR TO CYANIDING.

—	Scale Insect Present.	Adult Female.			Young Attached.		Young Unattached.		Males (Pupæ and Larvæ).			Remarks.
		Alive.	Dead after Oviposition.	Dead from Accidental Causes.	Alive.	Dead.	Alive.	Dead.	Alive.	Hatched Out.	Dead.	
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.		Per cent.	Per cent.	Per cent.	
Orange No. 1.	Circular Black Scale (*Aspidiotus ficus*). Badly infested	33	19	48	31	61	100	...	22	30	48	Two out of every three of the adult females were ovipositing. A few examples of White Scale insects were also present.
Orange No. 2.	Circular Black Scale (*Aspidiotus ficus*) and	52	34	14	73	27	100	...	37	29	34	A few examples of White Scale insects present.
	White Scale (*Chionaspis citri*). Badly infested	50										
Orange No. 3.	White Scale (*Chionaspis citri*). Badly infested	35	...	64	...	...	...	...	29	...	71	Nearly all the adult female scale insects commencing to oviposit.

NOTE.—The discordant results as to the proportion between dead and living scale insects of the same species would probably disappear on examining larger numbers of individuals than was done for the purpose of preparing this return.

EXPERIMENTS AND THEIR RESULTS.

[Experiments conducted 14th April. Fruit examined 24th and 25th April, 1899.]

Number of Experiments.		Condition of Fruit before Cyaniding, as regards—		Cyaniding.		Effect of Cyaniding, as regards—	
Group.	Individual Experiment	(1) Insect Life.	(2) Preliminary Treatment and Condition.	Strength of Gas.	Duration of Process	(1) Condition of Insect Life.	(2) Condition of Fruit.
I.	1	Infested with *Aspidiotus ficus* or Circular Black Scale of various ages	None	1 oz. avoir. pot. cyanide and 1 oz. fl. sulphuric acid to 150 cub. feet	1 hour	All dead ...	Badly injured by the process. (? Fruit originally a poor sample)
		Ditto	ditto	ditto	ditto	ditto ...	Comparatively uninjured; two or three spots of discolouration only present
		Infested with *Chionaspis citri* or White Scale, principally of various ages	ditto	ditto	ditto	ditto ...	Comparatively uninjured; three spots of discolouration only
	2	Originally scale infested. A few White Scale insects only. (Bulk removed by scrubbing.)	Dry scrubbed to remove scales without producing deep scratches	ditto	ditto	ditto ...	Un-uniformly coloured in course of ripening; yellow mottled with orange
		Originally scale infested ...	ditto	ditto	ditto	One or two scale insects still present, all dead	Very conspicuously injured, and keeping quality affected; half surface being already mouldy
		Ditto	ditto	ditto	ditto	All dead ...	Very conspicuously injured; brown pits over great part surface
	3	Infested with *Aspidiotus ficus* and a little White Scale	Fruit made wet, but not scrubbed	ditto	ditto	ditto ...	Injured; several brown patches at base
		Ditto	ditto	ditto	ditto	ditto ...	Injured slightly; two or three small spots only. Surface mildewy
		Ditto	ditto	ditto	ditto	ditto ...	Injured to a very marked extent
II.	4	Infested with *Aspidiotus ficus* (Circular Black Scale)	None	1 oz. avoir. pot. cyanide and 1 oz. fl. sulphuric acid to 300 cub. ft.	ditto	ditto ..	Injured. Two or three small sunken brown spots? Keeping quality impaired—half fruit being invaded by green mould
		Ditto	ditto	ditto	ditto	ditto ...	Injured. A few pittings due to cyanide action, more conspicuous on one face than elsewhere. Fruit somewhat mildewy on surface
		Ditto	ditto	ditto	ditto	ditto ...	ditto

EXPERIMENTS AND THEIR RESULTS—*continued*

[Experiments conducted 14th April. Fruit examined 24th and 25th April, 1899.]

Number of Experiments.		Condition of Fruit before Cyaniding as regards—		Cyaniding.		Effect of Cyaniding as regards—	
Group.	Individual Experiment	(1) Insect Life.	(2) Preliminary Treatment and Condition.	Strength of Gas.	Duration of Process	(1) Condition of Insect Life.	(2) Condition of Fruit.
II.	5	Originally scale infested ...	Dry scrubbed to remove scale insects without producing deep scratches	1 oz. avoir. pot. cyanide and 1 oz. fl. sulphuric acid to 300 cub. feet	1 hour	...	Injured. A few spots of injury discernible? Keeping qualities impaired, almost entire surface being occupied with green mould
		Ditto	ditto	ditto	ditto	Few Circular Black Scale still on, dead	Injured. Distinctly marked on two faces with discrete brown markings
		Ditto	ditto	ditto	ditto	ditto ...	Injured. Some very distinct shallow pittings discernible
	6	Infested with *Chionaspis citri* or White Scale principally	Fruit made wet, but not scrubbed	ditto	ditto	All dead ...	Injured. A few depressed brown marks. Un-uniformly coloured in process of ripening; mottled orange and yellow
		Infested with *A. ficus* ...	ditto	ditto	ditto	ditto ...	Injured slightly. Two spots apparent, located at sites previous injury
		Ditto	ditto	ditto	ditto	ditto ...	Injury practically none. Two small brown spots. Surface developing mildew
III.	7	Badly infested with *Chionaspis citri* or White Scale	None	1 oz. avoir. pot. cyanide and 1 oz. fl. sulphuric acid to 400 cub. feet	ditto	ditto ...	Injured slightly. Three small spots of brown discolouration only
		Badly infested with *Aspidiotus ficus* or Circular Black Scale, and with little White Scale	ditto	ditto	ditto	ditto ...	No injury discernible
		Ditto	ditto	ditto	ditto	ditto ...	Practically no injury. Three small spots of microscopical dimensions only present
	8	Originally scale infested ...	Dry scrubbed to remove scale insects. A few deep scratches produced	ditto	ditto	ditto ... [as regards few insects remaining]	Injured slightly. A patch of injury on one face; a few spots about stem, attachment, and site of scratches discoloured
		Ditto	ditto	ditto	ditto	ditto ...	Injured. Some shallow brown pitting
		With *A. ficus* and with Glover's Scale	But without producing deep scratches				
		Ditto	ditto	ditto	ditto	ditto ...	Injured. Some shallow brown pitting

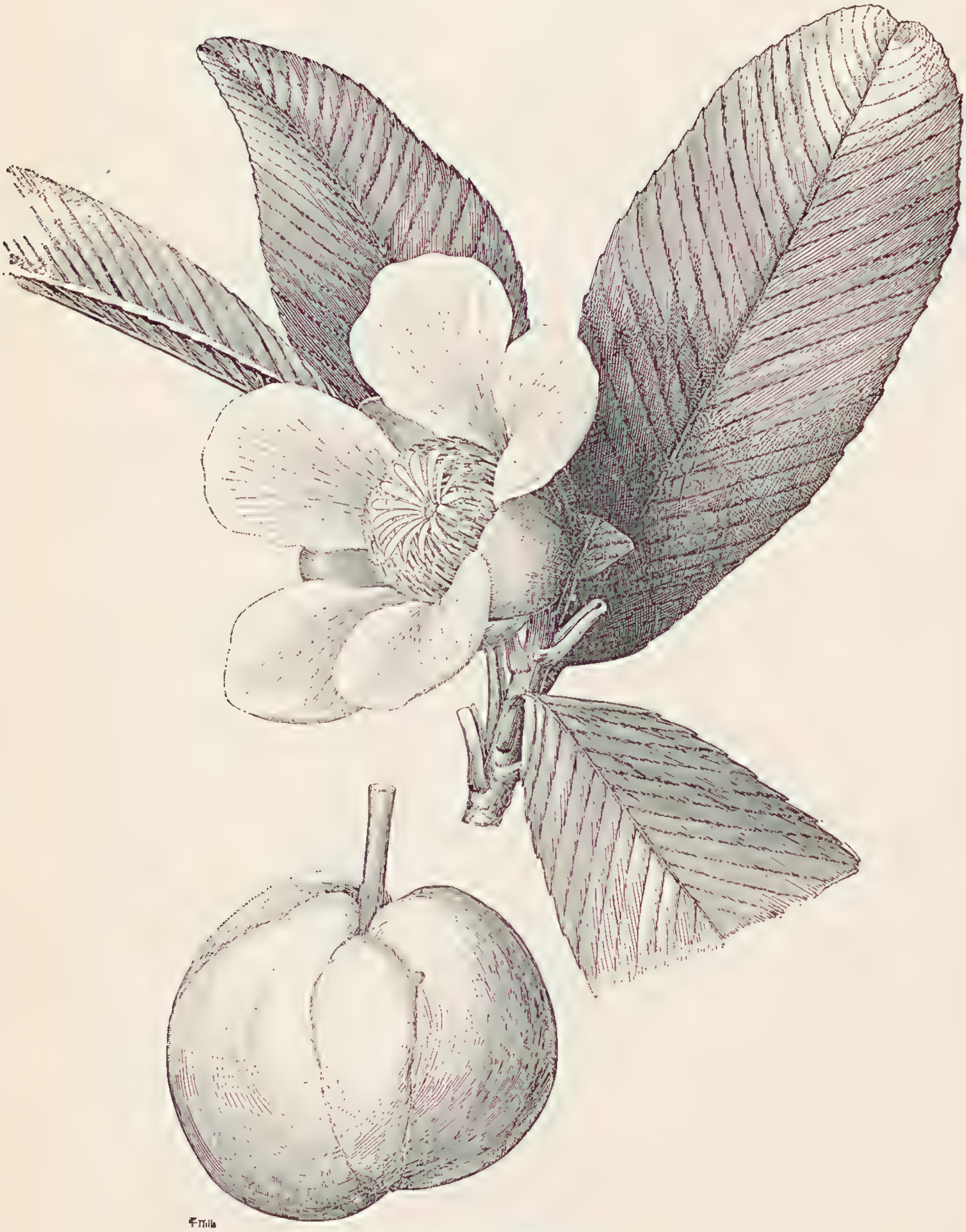
		Infested with *Aspidiotus ficus*	Fruit made wet, but not scrubbed	1 oz. avoir. pot. cyanide and 1 oz. fl. sulphuric acid to 400 cub. feet	..	All dead ...	Practically no injury. Two or three very small brown spots with brown discolouration
III.	9	Infested with *Aspidiotus ficus*, and with a little White Scale	ditto	ditto	1 hour	ditto ...	Injured slightly. One small blotch of discolouration and a few inconspicuous small spots. Slightly mildewy on surface
		Scale insect infested	ditto	ditto		ditto ...	Entirely covered in green mould
	10	Infested with Circular Black Scale (*A. ficus*)	None	1 oz. avoir. pot. cyanide and 1 oz. fl. sulphuric acid to 500 cub. feet	ditto	ditto ...	No injury. Possibly a heightening of colour
		Ditto	ditto	ditto	ditto	ditto ...	ditto
		Ditto	ditto	ditto	ditto	ditto ...	ditto
		Originally scale infested ...	Dry scrubbed to remove scale insects	ditto	ditto	ditto ...	No injury, but colour un-uniform. A few clouds of green and greenish yellow
	11	Ditto	ditto	ditto	ditto	ditto ...	Completely covered with green mould externally
IV.		Ditto	ditto	ditto	ditto	ditto ...	Injured very slightly; a few small indistinct depressed brown spots. Green mould on one face
		Infested with Circular Black Scale (*Asp. ficus*)	Fruit made wet, but not scrubbed	ditto	ditto	ditto ...	Injured slightly. One or two depressed brown spots. Colour somewhat un-uniform
	12	Ditto	ditto	ditto	ditto	ditto ...	Injured very slightly—faintest trace. Fruit developing mildew externally
		Infested with White Scale (*Chionaspis citri*)	ditto	ditto	ditto	ditto ...	Injury not discernible. Colour un-uniform: orange and yellow mottled.
		Thickly infested with Circular Black Scale (*A. ficus*)	None	1 oz. avoir. pot. cyanide and 1 oz. fl. sulphuric acid to 600 cub. feet	ditto	ditto ...	Uninjured
	13	Ditto	ditto	ditto	ditto	ditto ...	ditto
		Infested with White Scale (*Chionaspis citri*)	ditto	ditto	ditto	ditto ...	Injury scarcely discernible; a few small specks. Mildew commencing to develop on surface
		Originally scale infested ...	Dry scrubbed to remove scale insects without producing deep scratches	ditto	ditto	Few scale insects remaining on fruit dead	Injured. A patch of brown discolouration on one side, and brown spots. Un-uniformly coloured; yellow mottled with green
V.	14	Ditto	Dry scrubbed to remove scale insects without producing deep scratches, but some deep scratches produced	ditto	ditto	...	Injured slightly. Faint ill-defined reddish blotches in places. Slight reddish discolouration at site of scratches
		Ditto	Dry scrubbed to remove scale insects without producing deep scratches, but without scratching	ditto	ditto	...	Injured very slightly. One or two small spots; possibly marking position of old skin-wounds. Un-uniformly coloured in ripening

EXPERIMENTS AND THEIR RESULTS—*continued.*

[Experiments conducted 14th April. Fruit examined 24th and 25th April, 1899.]

Number of Experiment.		Condition of Fruit before Cyaniding, as regards—		Cyaniding.		Effect of Cyaniding as regards—	
Group.	Individual Experiment	(1) Insect Life.	(2) Preliminary Treatment and Condition.	Strength of Gas.	Duration of process	(1) Condition of Insect Life.	(2) Condition of Fruit.
V.	15	Infested with Circular Black Scale of various ages	Fruit made wet, but not scrubbed	1 oz. avoir. pot. cyanide and 1 oz. fl. sulphuric acid to 600 cub. feet	1 hour	All dead ...	Injured slightly. A few small blotches or spots, brown, and slightly depressed; surface developing mildew
		Ditto	ditto	ditto	ditto	ditto ...	Injured very slightly. A few indistinct green (on yellow) small marks.
		Ditto	ditto	ditto	ditto	ditto ...	Surface completely covered with green mould.
	16	Infested with Circular Black Scale, and in less degree with White Glover's Scale insects	None	Pot. cyanide 1 oz. avoir., sulphuric acid 5 oz. fl., water 10 oz. to 150 cubic feet. (Regulation quantities.)	ditto	ditto ...	Uninjured.
		Infested with Circular Black Scale	ditto	ditto	ditto	ditto ...	Injured to some extent at site of old wound where it is brown discoloured
		Ditto	ditto	ditto	ditto	ditto ...	Injured to slight extent only
VI.	17	Ditto	Dry scrubbed to remove scale insects	ditto	ditto	...	Injured; entire surface showing brownish clouding due to action of gas. Colour also non-uniform; green and yellow mottled
		Ditto	ditto	ditto	ditto	...	Injured. Trace of reddish-brown discolouration forming a small patch. A few small brown depressed spots. Colour un-uniform; yellow more or less mottled with green
		Ditto	ditto	ditto	ditto	...	Surface entirely covered with green mould
	18	Infested with Circular Black, Glover's, and White Scale—principally first	Fruit made wet, but not scrubbed	ditto	ditto	All dead ...	Uninjured, except where small skin blemish occurs, the latter appearing as if aggravated by gas. Fruit yellow
		Infested almost exclusively with White and Glover's Scale insects	ditto	ditto	ditto	Do. (?Eggs of *M. Gloveri*)	Uninjured
		Infested with Circular Black, Glover's, and White Scale insects	ditto	ditto	ditto	Do. (?do.)	Un-uniformly coloured; some parts orange, others uniformly yellow

Plate CXI.



DILLENIA SPECIOSA.

DILLENIA SPECIOSA, Thunb., or *INDICA*, Linn.

BY LEWIS A. BERNAYS.

THE subject of these notes will be new to your readers of the present day, although brought to public notice by me some fifteen years ago. I cannot, however, discover that there is any other specimen to be seen other than that growing successfully in the Acclimatisation Society's Gardens. It is a medium-sized evergreen tree, ordinarily attaining a height of about 40 feet, but, under favourable conditions, growing considerably higher. The trunk is straight, but of no great height; branches numerous, spreading, then ascending so as to form a regular, round, dense, shady head. The leaves are oblong, regularly serrated, very firm, with many large elevated parallel veins corresponding in numbers with and ending in the points of the serratures, about 9 inches long by 4 broad. The rough, old leaves are used to polish ivory, horn, furniture, tinware, &c. The flowers are very large, white, and fragrant; the bright yellow anthers, which are very numerous, forming a large globe in the centre, crowned by white lanceolate, spreading stigmas. The fruit is from 3 to 4 inches in diameter. The fleshy leaves of the calyx, when the fruit is *fully* matured, have an agreeable acid taste, and are eaten raw, cooked in curries, or made into sherbet. Inside are numerous reniform seeds, surrounded by a pellucid glutinous matter, used for making a palatable jelly, for a cough mixture, or a cooling drink in fevers, and otherwise. The bark and leaves are both astringent, and are used medicinally. The timber is light-brown, close and smooth grained, and is much used for gun-stocks, handles, &c., and is specially valuable for its durability under water. The tree is found in dense forests, at no great elevation, in all parts of tropical India, in the Peninsula, and in the Malayan Islands; and it is commonly cultivated in India for its ornamental appearance, and for its shade, as well as for its economic uses. The specimen from which the fruit examples in the Plate have been taken shows its capabilities under circumstances by no means favourable as to soil or climate.

Mr. Mitchell, the Curator of the Acclimatisation Society's Garden, informs me that he has a stock of plants on hand for distribution—I presume under the regulations in that behalf, whatever those may be.

From the same informant, who had jelly made in his own household from last season's crop, I learn that the product is delicious, the flavour being something between apple and rhubarb. As the gelatinous matter is very stiff, a good deal of water is required in the cooking. The fruit is better treated when quite young.

Roxburgh, speaking of this tree, says:—"When in flower it is one of the most beautiful trees I have ever seen."

The ripe fruit is slightly laxative, and must therefore be used with caution; but it is otherwise quite innocuous. Cleghorn gives "Peddakelinga" as the Indian native name.

There are other species of *Dillenia*, all handsome trees. One of these, *D. scabrella*, has similar qualities to *D. speciosa;* and a decoction of the leaves of another species, *D. retusa*, is reputed to have value for cleansing ulcers.

Viticulture.

FEDERATION AND THE QUEENSLAND WINE INDUSTRY.

BY E. H. RAINFORD, Viticultural Expert.

"WHAT will be the effect of Federation on our wine industry?" is doubtless a question that many Queensland vignerons have asked themselves and each other—a question not easy to answer, but of considerable interest to those engaged in the industry; and a consideration of the subject, with some suggestions, will not be out of place in the *Agricultural Journal.*

If Federation of the Australian Colonies is accomplished, there will necessarily be a considerable reduction, if not entire abolition, of the present duty in Queensland on wines from the southern colonies, and, as a consequence, our wines will suffer severe competition. How is that competition to be met and mastered?

Before entering on this question, let us first examine the position of the wine industry in this colony at the present moment. The number of individuals who actually make wine in Queensland in large or small quantities would almost run into three figures, but the vignerons whose wine is known and sold outside their own district can be counted on the fingers. Let us first see how the small producers will be affected.

For the most part they possess a limited number of vines, and generally of inferior varieties—quantity, and not quality of grape, being aimed at. The saccharine density of the must is generally low, and a quantity of sugar has to be added to it to ensure a wine strong enough to keep. The plant, too, is usually primitive and faulty, but, notwithstanding the defective arrangements of this class of vigneron and, generally speaking, the inferior quality of wine produced, they have nothing to fear from outside competition. The stock is limited to the yearly consumption of their local customers, who are apparently satisfied with the quality offered them. The only competitor is the local publican or grocer, probably several miles away, who can be disregarded. If, however, more farmers went in for viticulture and wine-making, the local competition would bring about a better class of wine than is generally made. Intending vignerons should be careful to plant the finer varieties of vines, and use concentrated must as a sweetening power instead of sugar, resulting in a saving in expense and in the production of a better wine.

But for vignerons whose products are sold outside their own district, and who, although few in number, constitute practically the wine industry of Queensland, the case is different: they will have severe competition, and the question asked above was—" How is that competition to be met and mastered?" There are two ways of doing it—Improve the quality of the wine, and decrease the cost of production. The first is an easier matter than the second, but both are to be done if only vignerons will study how to do so. No improvement in quality is possible, however, if vignerons stick to the idea asserted on more than one occasion to the writer that " Queensland wines are as good as any in Australia." Some Queensland wines are so, but they are exceptional, and invariably cost much more than a similar wine down south. Any professional man, comparing the bulk of our Queensland wines with those from South Australia and Victoria, must admit that the latter excel in all-round quality. The Queensland vigneron is not inclined to admit this, as, naturally, his judgment is biased in favour of his own products, but it is a fact nevertheless, and if he refuses to recognise it, and will not modify his system of manufacture, he will have a bad quarter of an hour if Federation is an accomplished fact. In pointing out the faults present in some of the Queensland wines, the writer is animated by no captious spirit; his criticisms are made solely with the desire to be of service to our vignerons. Moreover, they do not refer to all wines alike, as he has sampled very good wines in the colony of various makers; and he has no doubt whatever that, with a little more care practised in the selection of the grape and the preparation of the wine, Queensland vignerons will successfully compete with southern growers.

Most of our vignerons affirm that there is a very limited sale for pure light wines like clarets and Chablis, but they can find a ready sale for strong, dry, and sweet wines, and that they must make what they can sell. True; but is not the limited sale of light wines due to the fact that the low-priced qualities are not well made, and those that are cost too much? Winedrinkers may be divided into two classes—those who understand wine, and drink a pure, well-prepared wine if they can get it; and those who will drink anything so long as it is called wine and is sweet and strong. The former class find it difficult to get in Queensland a light, clean, well-prepared wine at anything like a reasonable figure; so deny themselves, and hence the limited sale.

The defects to be found in our light wines are coarseness, want of bouquet, presence of "twang," and, occasionally, signs of unsoundness, which in all probability arises from an after-fermentation or chemical decomposition in the bottle from the wine having been improperly prepared. Coarseness is almost invariably due, especially in red wines, to too long vatting with the husks and stalks; the latter are seldom, i ever, eliminated in the crushing, and communicate a coarseness and roughness materially affecting the quality. The wines should be fermented with the husks only, unless an astringent porty wine is required. The vatting should continue just long enough to draw sufficient colour from the skins, and then be stopped. It is true that in some districts in France the vatting continues until the saccharometer marks zero with good results, but this procedure cannot be adopted in this colony with production of clean fresh wines. A Mataro or Hermitage grown in Queensland is quite different to the same grapes grown in France; they are coarser, and the husks contain a larger amount of tannin and extractive matter, and they must be treated accordingly. In South Australia the system of stalking the grapes is now almost universal, the benefit of doing so having been recognised, and machines are now cheaply sold which crush the berries and remove the stalks in one operation. Must intended for Chablis should never be vatted; on the contrary, it should be run into casks without loss of time to obtain as colourless, clean, and limpid a wine as possible.

The want of bouquet may be due to several causes—insufficient acidity of the must, fermentation at too high a temperature giving rise to bacterial products affecting the bouquet; using inferior varieties of grapes, and addition of sugar to the must. Deficient acidity is easily proved and remedied, and the temperature of the fermenting vat can also be regulated. Advice on these points has already been given in this *Journal*. Inferior grapes should be grafted or replanted. The use of cane sugar in the must materially influences the bouquet of wine. The addition is made for the purpose of increasing the saccharine density of poor musts in greater or less quantity, as the wine is destined to be claret, port, &c. The bouquet of wine is due to ethers developed during fermentation, and fermenting cane sugar develops a bouquet peculiar to itself, and not too agreeable, which masks more or less the natural bouquet developed by fermenting grape sugar, according as more or less cane sugar has been added; hence the sameness of smell in so many Queensland wines. That the must is so deficient in density as to require the addition of cane sugar to make light wines points either to inferior varieties of vines having been planted, too humid a subsoil, or to what is far more likely, a mistaken system of pruning, forcing a large crop of grapes, with consequent low saccharine density. A must with 18 to20 per cent. density requires no addition to make a claret or a Chablis, or with 22 per cent. for a Burgundy the resultant wines would only require a cool cellar and careful supervision. If the must has naturally a higher density, the wines will be fuller bodied, but they will all, if the must had sufficient acidity, develop a finer bouquet and be cleaner to the palate than wines made from sugared musts.

The presence of "twang" may be due to the use of American varieties of grapes, to the addition of large quantities of cane sugar to a very acid must, or to the wine having been fermented at too high a temperature and containing volatile acids.

With regard to the Queensland sweet and fortified wines, there is also room for improvement, and our vignerons must not think that, because they are largely consumed, they are perfect. If a better article at the same price is offered by southern vignerons, it will find a sale, and the South Australians make some excellent sweet and fortified wines. The same faults are apparent in this class of wine, generally speaking, as in the light wines—viz.: twang and want of bouquet, both arising from too free a use of cane sugar in the fermenting vat. A great improvement in wines of this class could be made by using, as a blend, a wine made by artificially checking the fermentation of a high-quality must. This is the practice universally followed in Spain, Portugal, Greece, and

other wine-making countries, and this wine is variously called Solera, Jeropiga, &c. The sweetening power is grape sugar, which, by slow after-fermentation, produces a fruity, aromatic bouquet. Some sweet wines in Queensland are made from varieties of grapes eminently unfitted for their manufacture, and the cost of the sugar to remedy the deficient density is a serious item in the expenses bill.

A better selection of vines when planting the vineyard is wanted. That vines producing high-density musts will do as well as others, is not to be doubted. The writer has seen, on several occasions, grapes giving 26 degrees density growing alongside others giving 20 degrees and 22 degrees, the latter being only fit to make light wines, but were being made into port with the others. In this respect this Department will be able to give future planters considerable assistance, as at the State farms records will be kept of the must densities of numerous varieties of wine grapes under different systems of pruning and cultivation. In South Australia it is now recognised that to make good light wines the finer varieties of grapes must be planted, such as Carbenet, Malbeck, Merlot, Hermitage, Sauvignon, Riesling, &c. With the exception of the Hermitage, very few of the above are to be found in Queensland—partly because some of them, unskilfully cultivated, did not do well at first, and so vignerons discontinued planting them; and partly because they do not give the crops which some of the coarser varieties yield. But seldom can you get both quality and quantity; and if fine wines are to be made, quantity must be sacrificed.

The other point to be studied, in meeting southern competition, is the cost of production, and here vignerons are confronted with greater difficulties than with improvement of quality. Man cannot change climate, and that is one of the drawbacks that our vignerons have to contend against; but granted the climatic influences on cost of production, the cost of grapes in this colony is far too high. Is the difference in cost of wages between this and the southern colonies so great that grapes bought in South Australia for £2 a ton cost here £8 and £9 a ton, as was the case this season? Or does the climate entail such an extra amount of cultivation as to account for the difference? Let us see.

A certain vineyard of 300 acres in South Australia is cultivated by contract for 35s. an acre. This vineyard is cultivated on the bush system, and can therefore be cross-ploughed.

The cultivation consists of pruning, sulphuring, two ploughings, disbudding, and two or three scarifyings.

Another vineyard of 150 acres, but trellised, costs 50s. per acre by contract. But as the vines are mostly Carbenet and other vines pruned to long rods, much more time is lost in the pruning, and this price, besides the two ploughings and three scarifyings, includes the hoeing of the strips left by the plough.

Another vineyard of 20 acres is contracted for at 30s. per acre, but the owner has to pay for the sulphuring and hoeing round the vines. These figures are supplied by one of the principal vignerons in South Australia, and are to be relied on. He says that the sum of 35s. may be taken as a fair average for the cultivation of a vineyard in South Australia, exclusive of picking the grapes and delivering. To come to details, the same gentleman writes that pruning, when done by piece, costs from 1s. to 1s. 6d. per 100 for bush vines, and from 2s. to 2s. 6d. for trellised. Men are paid 4s. 6d. a day and find themselves, or 4s. if provided with a house; carters and foremen, 6s. a day.

The average crop is under 2 tons to the acre, as not only are droughts frequent, but the vines are planted wider apart than in Queensland. In fact, taking one year with another, it would be nearer one than two.

The price of grapes for some time in South Australia has been £2 a ton for Mataro or Espar and similar kinds, delivered; £4 to £5 for Hermitage, and £7 for Carbenet, Malbeck, &c. It will be seen that at £2 a ton for Espar grapes the grower has little or no profit, and for this reason many farmers in South Australia are now grubbing up their Espars or grafting to Carbenets.

The figures given by the New South Wales Viticultural Expert are as follow:—Pruning, 10s. per 1,000 vines, a man pruning 500 a day. If, then, an

acre contains 700 vines, the cost will be 7s.; two ploughings at about 8s. per acre each; four scarifyings at from 2s. 9d. to 3s. each; hoeing round vines at 6s. per 1,000, or 4s. 3d. per acre; disbudding, from 1s. to 3s. per 1,000, according to variety of vine, or, taking an average of 2s. per 1,000, this would amount to 1s. 5d. an acre, or a total cost of 40s. 8d per acre without sulphuring, which is a trifling cost.

Another estimate sent from the Albury district gives the total cost of cultivation at slightly under £2 the acre, so that there is but little difference between it and the Viticultural Expert's estimate. It will be understood, however, that the above figures may vary in certain localities with peculiar soils and circumstances, but they may be accepted as a fair average cost.

The Albury correspondent states that for bush vines, 1 to 1½ tons per acre may be considered an average crop in that district; but it is higher for trellised vines.

Prices this season at Albury were from £3 10s. to £5 per ton, the latter price being for *Frontignac* or *Brown Muscat.*

Another correspondent from Corowa, New South Wales, gives the total cost of cultivation at about 30s. per acre—a fair average crop in good seasons at 1½ tons per acre; and the price for Shiraz, Malbec, Tokay, Riesling, &c., from £3 to £4 per ton.

No figures are to hand from Victoria, but it may fairly be taken for granted that they would differ but little from those already given.

From the above figures, it results that the average cost of cultivation for an acre of vineyard in South Australia is from 35s. to 50s., and in New South Wales from 30s. to 50s. The ordinary vineyard labourer receives 24s. to 27s. per week in South Australia, and 30s. in New South Wales, as may be calculated from the pruning.

The average crop in South Australia for bush vines is under 1½ tons to the acre, and about 2 to 2½ tons for trellised vines; and in New South Wales, 1½ tons for bush vines, and, probably, about 2½ tons for trellised.

The average price of grapes per ton in South Australia is from £2 to £7 according to quality, the lower price being for varieties of grapes which are common in Queensland; and in New South Wales from £3 10s. to £5, the latter price being for Muscats.

A perusal of the above figures then shows that, in South Australia, 1 ton of grapes, similar in quality to those grown in Queensland, costs from £2 to £4 the ton; the crop is from 1½ to 2½ tons per acre according to system of cultivation, and the cost of cultivation from 35s. to 50s. per acre. In New South Wales the cost per ton of grapes is £3 10s., the crop is from 1½ to 3 tons, and the cost per acre for cultivation 30s. to 50s., or, as nearly as possible, the same for the two colonies, and in all probability the figures for Victoria would differ very slightly.

Compare now the cost of Queensland grapes this last season of £8 and £9 per ton. How can the vigneron buy grapes and compete with southern wines if Federation is accomplished? The price is too high, and must be considerably reduced if the industry is to be in a position to meet competition. It may be answered that the cost of cultivation is so much more here than in the south, some vignerons putting it as high as £8 the acre—few lower than £5. Let us examine the matter. From the figures afforded by southern correspondents, it is plain that field labour does not cost more in Queensland than down south, for 27s. to 30s. a week is, if anything, rather more than with us. So that, given the same amount of cultivation, the cost should be a little less in Queensland. Does the vine in Queensland require the extra amount of cultivation by reason of her climatic conditions to warrant the difference in price? Most emphatically, No! The only difference would be in the number of scarifyings. The southern colonies average two ploughings and three scarifyings. Add six more of the latter for Queensland, make it two ploughings and nine scarifyings, which is ample calculation, and the increase is only 18s. per acre, and against this should be placed a bigger average crop than is obtained in the south. On the other

hand, there is damage to crop in those years when the rains are early; but information supplied from Roma, the principal grape-growing district, indicate that this is the exception and not the rule.

Since the extra cultivation required does not account for the higher price of Queensland grapes, it must be inferred that the demand exceeds the supply, and more vines should be planted. There is a large consumption of grapes for eating purposes, and the produce of more than one vineyard is yearly sold in the markets for the table, thus reducing the supply upon which vignerons could draw. It is perfectly certain that with grapes at £8, or even £6, per ton, the Queensland winemakers will be handicapped against the southern makers, and the reduction in the price of grapes by more extensive cultivation is clearly a necessary step towards meeting competition.

Some vignerons continue the cultivation of the vines long after the crop is off. This is a mistake, and adds to the expenses. Late cultivation prolongs the activity of the vine when it should be getting rest. To keep down the weeds, put one or two sheep in the vines, or any other animal that can be depended upon not to chew the canes.

Another point upon which economy could be practised is in harvesting the crop and in the vintage operations, a lamentable loss of time occurring in places from want of system and organisation. There can be no doubt whatever that the harvesting and vintaging in the south costs less per acre than in Queensland generally speaking.

Roma vignerons should also agitate for an equalization of rates for the carriage of grapes and wine. At the present time the railway carriage of a given quantity of wine costs double that of the quantity of grapes required to make it, and the latter take up five or six times more room. The result is that winemakers find it more profitable to bring Roma grapes down to the coast and make the wine there. It is unnecessary to point out that grapes that have been knocking about in a hot truck two or three days cannot make a wine as sound and of equal quality to that made from freshly picked grapes. As matters are now, a cask of wine can be sent at less cost from Adelaide, Melbourne, or Sydney to Brisbane than from Roma.

Having made the above suggestions for improvement of quality and reduction of cost, the writer has one or two suggestions to make regarding the trade. Persistent agitation should be kept up for the increasing of the number of retailing wineshops. If an individual can get a glass of fair claret for 3d. at a retail wineshop, he will not pay 6d. for it at the hotel bars, and an increase in the number of retailers would mean an increase in the wine consumption.

Queensland winemakers should not delay adopting the baby bottle, holding half-a-pint. There is no doubt that it is a great nuisance to the bottler, but its adoption in South Australia and Victoria has enormously increased the consumption of their wines. Thousands now regularly drink a sixpenny "baby" of Chablis or claret with their lunch, who formerly drank a glass of beer. Anything that tends to increase consumption must benefit the trade, and the adoption of the "baby" will undoubtedly have that effect, as already proved in the southern colonies.

A DESCRIPTION OF SOME VINES GROWN AT THE GOVERNMENT STATE FARMS.

No. 2.—THE SERVANT.

By E. H. RAINFORD,
Viticultural Expert.

VIGOROUS grower.

Leaf.—Dark-green above, five lobed, not deeply indented, very slight down below, petiolar sinus open, teeth short.

Bunch.—Large, winged, and loose with a thick stalk.

Berry.—Large, round to slightly elliptic, firm rather thick skin, greeny-white in colour, abundant bloom, and of agreeable flavour.

SERVANT (Natural size).

Plate CXII.

REMARKS.

This variety of table grape has of late years largely come into fashion with the French cultivators of table grapes for the Paris market, as it is not only a good carrier, but the vine is very productive. It is a late ripener, and comes in after the earlier grapes are over, and, if carefully packed, is always a very attractive grape. Its great merit, however, is its being able to support long journeys with a minimum amount of damage. This grape is also very resistant to attacks of fungoid diseases, but should nevertheless be looked after, especially coming to a new climate. The vine can be grown in bush fashion or on trellis, and bears equally well whether pruned long or short.

Botany.

CONTRIBUTIONS TO THE FLORA OF QUEENSLAND.

By F. MANSON BAILEY, F.L.S.,
Colonial Botanist.

Order DILLENIACEÆ.

HIBBERTIA, Andr.

SECTION EUHIBBERTIA.

H. Bennettii, *Bail.* (n. sp.) A spreading shrub, from 6 to 18 in. high, quite glabrous, branches angular. Leaves linear-lanceolate, 1½ to 3½ in. long, 2 to 4 lines broad, slightly expanding, and shortly stem-clasping at the base, underside pale, veins obscure, margins revolute, apex subulate. Peduncles terminal on the branchlets, somewhat flattened, 6 to 12 lines long; bracts at base shortly clasping the peduncle, the one close under the flower narrow-lanceolate, 3 to 4 lines long, often spreading. Expanded flower nearly 2 in. diameter. Sepals ovate-lanceolate, 6 to 8 lines long, 3 to 4 lines broad, the inner ones the broadest, with more scarious margins. Petals obovate, or broad-cuneate, with a minute mucro in the centre, but scarcely showing lobes. Stamens numerous, filaments about 2 lines long. Anthers oblong, obtuse, opening laterally, about ½-line long, only a very few of the outer filaments without anthers. Carpels 3, glabrous, 3-ovulate. Seeds globose, brown, 1½ line diameter.

Hab.: Irvinebank, *F. Bennett*, who states that the plant is known locally as the "Arsenic Plant," and that it is exceptionally poisonous to stock. It may here be remarked that several years ago another Northern species—viz., *H. longifolia*, F. v. M.—was suspected of poisoning stock.

Order STERCULIACEÆ.

STERCULIA, Linn.

S. Garrawayæ, *Bail.* (n. sp.) A tree attaining the height of 23 ft., with a rough bark. Branchlets and leaves clothed with a thin, hoary, stellate, pubescence. Leaves orbicular-cordate, entire or very bluntly 3 or 5 lobed, the middle lobe the smallest when only 3-lobed. The entire ones about 1½ in. diameter, others to 4 in. long, 5 in. broad, nerves 5 to 7, palmate, prominent, as are the transverse veins. Margins entire. Petioles slender, 1 to 3 in. long, strongly striate. Flowers in short few-flowered axillary racemes. Calyx campanulate, about 9 lines long, dull-red, cleft for about a quarter down, lobes rounded, the margins induplicate; inside the tube above the base is a ring of broad, divided, tomentose, reflexed scales. Staminal column densely clothed with rather large, stellate hairs for half its length from the base, the filaments thence free, and glabrescent to the head of anthers. No abortive ovary. Female flowers in appearance like the male; stipes of ovary with a dense ring of sessile, sterile anthers at the top. Ovary consisting of 5 connate carpels, styles almost straight and free to the stigmas, densely stellate tomentose throughout. Stigmas recurved. Follicles on stipes

of about 8 lines besides the 2-lines original stipes of the ovary; $2\frac{1}{2}$ in. long, $\frac{3}{4}$-in. broad in the centre, rostrate at the end, sparsely stellate tomentose outside, densely villous inside as well as the loose integument of the seeds. Seeds yellow, closely packed, about 12 or 13 in each follicle.

Hab.: Palmer River, *Mrs. R. W. Garraway* and *Dr. W. E. Roth*. The former also forwarded some excellent sketches of the present and several other Palmer River plants. Flowering about March. In many respects the present species approaches *S. ramiflora*, Benth. The leaves, however, are never angular or acuminate, and the flowers are pedicellate, not nearly sessile, as given in the Fl. Austr. I. 227, for *S. ramiflora*.

S. vitifolia, *Bail.* (n. sp.) A small tree; the branchlets, foliage, and inflorescence densely clothed with a loose, short, stellate, light-brown pubescence; branchlets rather slender, reddish-brown beneath the pubescence, somewhat terete, internodes often long. Leaves orbicular-cordate, 3 to 6 in. diameter, entire or more or less 3-lobed; the lobes short and very obtuse, very rugose on the upper, prominently and closely reticulate on the underside, both surfaces clothed with a short, close, stellate pubescence; petioles rather slender, from 2 to nearly 5 in. long. Flowers few, in pedunculate cymes at the ends of the branchlets; bud cylindrical-conic, about 8 lines long, 3 lines broad, lobes induplicate; expanded flower 8 to 9 lines diameter, seems to be a purplish-red inside, densely stellate-hairy outside; inside of the tube and lobes nearly glabrous. Staminal column glabrous under the head of anthers, hairy towards the base. Follicles rostrate cymbiform without the stipites, $2\frac{1}{4}$ in. long, densely villous. Stipites rather long. Seeds about 6, villous.

Hab.: Fairview E.T. Station, Laura, *T. Barclay-Millar;* Palmer River, *Mrs. R. W. Garraway.*

Order ACANTHACEÆ.

JUSTICIA, Linn.

J. notha, *C. B. Clarke.* (Hook. in Fl. Brit. Ind. IV. 537.) Stems simple or with a few erect branches from the base, about 1 ft. high, glabrous, almost terete, more or less marked with 4 or more lines or angles, often much contracted at the nodes below the leaves in the dried specimens. Leaves about $1\frac{1}{2}$ in. long, sessile, oblong, obtuse or acuminate at the apex, sub-obtuse and sometimes more or less auriculate at the base, coriaceous, irregularly transversely lineolate, glabrate above, when young bearing white setæ on the nerves beneath. Spikes about 2 in. long, terminal, solitary, and dense. Bracts about 3 lines long, lanceolate (elliptic, *Clarke*), usually erect, with a few setæ on the margins and midrib, especially towards the end, otherwise glabrous. Flowers hairy, corolla white with purplish lines inside. Capsule ($\frac{1}{3}$-in., *Clarke*), none on the Queensland to hand. *Rostellularia simplex*, Wight Ic. t. 1542 (not of D. Don)—*Clarke, l.c.*

Hab.: Herberton, *R. C. Burton.* Irvinebank, *F. Bennett.* Evidently indigenous in Queensland; other habitats according to Hooker l.c. doubtful.

Order GRAMINEÆ.

PASPALUM, Linn.

P. conjugatum, *Berg.* Hook. Fl. Brit. Ind. VII. 11; Trin. Sp. Gram. Ic. t. 102. Stems stoloniferous, branching, somewhat flattened, the erect stems 2 or more ft. high, slender. Leaves 4 to 6 in. long and about 3 lines broad, tapering to fine points; sheaths loose with often a few hairs along the margin and a ring of hairs at the top, those at the back of the leaf being much shorter than those bordering the narrow ligula. Peduncle very slender. Spikes most frequently 2, divergent, 3 or more in. long, rhachis glabrous. Spikelets imbricate, very pale, plano-convex; glumes with marginal, villous nerves, and obsolete median; 2nd glume hyaline, margins ciliate; 3rd glume coriaceous, apiculate, white.

Hab.: A grass of tropical regions. Lately received from *Mr. W. C. Harding*, Johnstone River. This grass is of too weak and straggling a habit to recommend for pasture or growing for fodder. Some years ago I noticed it in the hothouse at Bowen Park, and thought it an introduction; it seems, however, to be indigenous on the Johnstone River.

Plate CXIII.

Hibbertia *Bennettii.*

PANICUM, Linn.

P. muticum, *Forsk.* Fl. Æg. Arab. 20; Hook. in Fl. of Brit. Ind. VII. 34. Stems stout, 6 to 8 ft. long, falling and rooting from the joints; nodes softly bearded, rarely glabrescent. Leaves 6 to 10 in. long, from under ½-in. to ¾-in. broad, base subcordate, sheaths glabrous or hairy. Ligula short, ciliate. Panicle sometimes deltoid, glabrous, erect, 5 in. or more long; rhachis narrow, flattened, stiff, and scabrous. Spikes alternate, lower ones distant, stout, simple or divided below, 1½ to 4 in. long. Spikelets turgid, usually crowded, sometimes solitary and alternate, acute, glabrous, green or purplish. Outer glume about quarter the length of the third, ovate, acute, 1-nerved; 2nd and 3rd glumes subequal 5-nerved; 3rd paleate male, 4th ellipsoid obtuse, margins narrowly incurved, obscurely dotted or roughened.

Hab.: A grass of Java, Africa, America, and the East Indies. According to Hook, in Fl. Brit. Ind. l.c., this species should include *P. barbinode*, Trin. Sp. Gram. Ic. t. 318, and several species of other authors. It was first introduced into Queensland by the late Dr. Joseph Bancroft. Specimens from these plants were submitted to me, and I considered the grass a form of *P. barbinode*, or *P. fuscum*, and under the latter name it has appeared in some of my publications; but from Hooker's account of *P. muticum* it seems better placed under that species. The species is admirably adapted for damp land, and in such localities it produces a large amount of succulent fodder.

CHRYSOPOGON.

C. aciculatus, Trin. Fund. Agrost. 188; *Rhaphis trivialis*, Lour., Trin. sp. Gram, Ic. t. 8 and 9. Stems leafy, extensively creeping below, thin, erect, 1 to 2 ft., slender. Leaves 1 to 5 in. long, 2 to 3 lines broad, flat, obtuse or acute, often undulate, glaucous, glabrous, margins spinulose; sheath terete; ligula a very narrow ciliate membrane. Panicle 1 to 3 in. long, pale or purplish; branches capillary, scaberulous or villous below the spikelets, tips obliquely truncate. Sessile spikelets 2 lines long; callus nearly as long as the glumes, acicular, shortly bearded; 1st glume chartaceous, obscurely 2 or 3 nerved or nerveless; 2nd lanceolate, acuminate or aristulate, 1-nerved; 3rd linear-oblong, 2-nerved; 4th linear, acuminate; awn 2 to 3 lines long, scabrid; palea small, linear, obtuse, glabrous, nerveless. Pedicellated spikelets purple, much longer and narrower than the sessile; pedicels slender, scaberulous; 1st glume subulate-lanceolate, aristulate, 3-nerved, ciliate; 3 and 4 shorter, ciliate; palea minute, cuspidate. (*Andropogon aciculatus*, Retz. Hook. Fl. Brit. Ind. VII. 188.)

Hab: Mulgrave and Johnstone Rivers. This grass produces a close turf, and is often found in company with *Paspalum platycaule*, but is far inferior to it on account of its sharp seeds.

PLANTS REPUTED POISONOUS TO STOCK.

By F. MANSON BAILEY, F.L.S.,
Colonial Botanist.

ARSENIC PLANT (*Hibbertia Bennettii*).

(PLATE CXII.)

THIS forms a shrub from 6 to 18 in. high, with linear-lanceolate, shortly stem-clasping leaves very variable as to size, the largest attaining a length of about 3½ in., the upperside green, underside more or less pale. Flowers yellow, about 2 in. in diameter. Stamens numerous, a very few of the outer ones without anthers. Fruitlets 3, not hairy, containing 3 round seeds each. For botanical description, see "Contributions to the Flora of Queensland" (*Queensland Agricultural Journal*, June, 1899). Mr. F. Bennett, who forwarded specimens of this plant from Irvinebank, Herberton, says that it is there considered exceptionally poisonous to stock. It may be here stated that another species (*Hibbertia longifolia*, F. v. M.) has several times been received as a suspected poison plant. Several species of the order to which the present genus belongs have been used medicinally and for culinary purposes, but so far none is recorded as possessing poisonous properties. The species of the genus *Hibbertia* are numerous in Australia, about 24 occurring in Queensland.

PLANTS REPUTED POISONOUS TO STOCK.

NATIVE TOBACCO.

AMONGST the native plants of Australia known to be poisonous to stock, one said to be the most noxious is the Native Tobacco, found growing in one form or another over the whole of the Australian Continent. It belongs to the order Solanaceæ, and its botanical name is *Nicotiana suaveolens*, Lehm., Hist. Nicol. 43, Flora Austr. IV. 469.

It is an erect annual or biennial plant from 1 to 4 feet in height, and is usually covered with viscid hairs. The lower leaves are the largest, often reaching to 1 foot in length, the upper ones being, as shown in our illustration, narrower and usually stalkless, sometimes clasping the stem with their base. In one variety (*parviflora*) only about 1 inch long, and not spreading much at the mouth; in another variety (*longiflora*), usually met with inland, the flowers are several inches long, and expand into an open flower like a petunia, or Marvel of Peru. Capsule ovate, slightly pointed, and full of small seeds.

There is a general consensus of opinion amongst stockowners that this plant is poisonous to stock. It is credited with causing the deaths of many travelling sheep. Mr. Hutchison instances a case which came under his notice of 300 rams being poisoned by it. The effects upon sheep are—drooping head, dull eye, swollen tongue, and, a few hours before death, paralysis of the loins.

Dr. T. L. Bancroft, in a note communicated to the Royal Society of Queensland, in January, 1886, has shown that this plant is undoubtedly poisonous, and this is due to the presence in it of an alkaloid having all the physiological properties of the nicotine of the true tobacco plant.

The above description of the plant, and the illustration, are from the publication on "Plants Reputed Poisonous and Injurious to Stock," by Messrs. F. M. Bailey, Government Botanist, and P. R. Gordon, Chief Inspector of Stock.

A remarkable circumstance connected with this and some other reputed poisonous plants is that, whilst in one part of a district it is declared to be deadly to stock, in another, at no great distance, it is looked upon as an excellent fodder.

The late Mr. Jacob Low, who was undoubtedly a first-class judge of fodder plants suitable for sheep, stated that the Native Tobacco was splendid sheep feed, and the animals grazing on it became rolling fat. Yet we are told by another good authority that hundreds of sheep have died from its effects, whilst a scientific man like Dr. Bancroft also gives testimony to its deadly qualities. The question arises, "What can one believe when such conflicting evidence is given by men who ought to know what they are talking about?" It would seem that the only plan by which certainty on such points can be attained would be to make practical experiments, by growing the plants and offering some sheep as a sacrifice in the general public interests.

We have lately been informed that all wattle-trees possess very poisonous qualities. Who would believe that a wattle-tree could be poisonous? "Yet there is not the slightest doubt" says Dr. Lauterer, in a paper read before the Royal Society of Queensland, "that the Black Wattle (*Acacia Cunninghamii*), although quite innocent when it blossoms and after it has borne fruit, contains a large amount of saponin in the unripe pods, and a small amount of it even in the leaves and in all green parts of the plant. Saponin has been found in *Acacias* as far back as 1871.

"In 1886 Dr. T. L. Bancroft, in a scrub on the Gregory River, by accidentally biting the pod of *Acacia delibrata*, found that it had a very disagreeable, acrid taste. It seemed so strange that an *Acacia* should have any but an astringent taste that a quantity of the pods were gathered with a view to ascertain if they contained a physiologically active substance. The result of Dr. T. L. Bancroft's investigation was the discovery of saponin in the pods of *Acacia delibrata*.

"After Dr. Bancroft, Mr. M. Thiel, in 1889, drew attention to the occurrence of a variety of saponin (called moussenin) in the bark of the Abyssinian *Acacia*

Plate CXIV.

Nicotiana suaveolens
(Native Tobacco)

Anthelmintica, which is used as a taenicide, or remedy against tapeworm, by the natives, by whom it is alleged to be more effective for the purpose than Kuosso, whilst less disagreeable in taste. Many of the 320 species of our Australian *Acacias* have been found by me to contain saponin all the year round—*e.g.*, the New South Wales species (*Acacia verniciflua*, Cunn.), which is called 'dogwood' by the bushmen around Bathurst, and which is used as a fish poison by them.

"Other species are quite free from saponin at certain times of the year, and rich in it at other times, such as *Acacia Cunninghamii* and *A penninervis*. These Brisbane black wattles blossom in the spring month of September, and show the pretty flowers for about a fortnight. After fertilisation has taken place, the pods begin to grow. In about 3 weeks they attain the length of 2 inches, with a narrow width and twisted appearance which has gained them the name of 'wattle curls' from the school children in the bush. In this state the pods have a purely astringent taste. They contain about 20 per cent. of catechu-tannic acid, and not a trace of saponin. They continue to grow during the fourth week. The tannin then disappears gradually, whereas saponin by degrees takes its place. The astringent taste gives way to an extremely nauseous, acrid, and disagreeable sensation on the tongue, especially on the back parts and the sides of it. This taste creeps over the whole tongue, if even only the tip of it is brought into contact with the bruised pod. It continues long, and leaves a slight sense of numbness on the tongue. If the juice of the pod is allowed to reach the back part of the tongue, it seems to irritate some branches of the *nervus vagus*, as it produces a short hacking cough, and the same sensation as when the inside of the ear or the skin behind the ear is scratched with a sharp instrument.

"A watery infusion of the 'wattle curls' froths and forms a lather, when agitated, like a solution of soap, and this property is due to the saponin, which has been obtained pure by me from the pods. The tannin has to be removed first from the inspissated infusion or watery extract by shaking with ether, which does not dissolve the saponin. Chloroform then takes out the saponin, which can be estimated quantitatively after evaporation. It is a white powder, and is dissolved by sulphuric acid with a red colouration. I found 3 per cent. of saponin in the unripe pods of *Acacia Cunninghamii*. Saponin is a strong poison for the muscle and the nerve, producing anæsthesia very much like the cocaine; but, besides this, it acts as a powerful irritant. I have seen many cases of so-called 'sandy blight' of the eyes of bush people at times when there was no sand and no wind, and in people where every suspicion of a specific infection was excluded. In one case it was easy for me to trace the real cause. The bushman, who suffered from a very acute conjunctivitis, with swelling of the lids, had the fingers of both hands covered with a sticky substance, which, on being washed away in a small basin, caused a very marked frothing in the water. The 'sandy blight' of the woodcutter was caused by the juice of the "wattle curls,' brought in contact with the eyes by wiping them with the hand.

"The hypodermic injection of the extract of only one unripe pod of *Acacia Cunninghamii* into the arm of a person caused great pain, swelling, and redness of the injected spot, nausea, and shivers; the extract of two pods caused headache, formications in the legs and arms, and paralysis of the accommodation of the eye and mydriasis. It is beyond doubt that the juice of six wattle pods, hypodermically injected, will kill a man. Injected into the leg of a frog (*Hyla coerulea*), it produced total insensibility of the leg against even the strongest local irritation, and total paralysis of the muscles."

As the commercial saponin, in doses of 2 drachms, is a deadly poison to dogs, it may well be supposed that a dose of 6 drachms would kill a man; and this quantity is contained in the extract from only 2 lb. of "wattle curls."

There is one point left to be discussed—the occurrence of saponin in the *Acacia* leaves at the time when it is found to occur in the pods. Is it formed in the leaves, and does it migrate to the pods? Or, is it formed in the pods, and does it go to the other parts of the plants from there? The question is a

difficult one; still, an answer is given (1) by the fact that saponin makes its appearance first in the unripe pods, and only after some days in the leaves; (2) the analogy with similar processes shows that tannic acids in many instances are found in unripe fruits, to be transformed into sugar when the fruits ripen, as in the case of the banana, which is rich in gallotannic acid, and even when cut off the tree will lose nearly every trace of tannin, and get rich in sugar and vegetable slime.

In the case of the Peach-leafed Poison Bush (*Trema aspera*) which has been denounced by some as injurious to stock, it would seem that the difficulty with this plant lies, not in poisonous properties, but in the indigestibility of the fibrous leaves. The fibre remaining in the animal's stomach becomes hardened into balls, in the same manner as hair is found matted and hardened in the stomach and intestines of cows, horses, and pigs, eventually causing the animal's death.

Economic Botany.

By F. MANSON BAILEY, F.L.S.,
Colonial Botanist.

THE KEI APPLE (*ABERIA CAFFRA*, Hook).

(PLATE CXV.)

A LARGE shrub, native of the Cape of Good Hope and Kaffirland, furnished with strong, straight, long spines, and rather small obovate leaves. The round lemon-coloured fruit, which is about 1 inch or more in diameter, has an agreeable somewhat acid flavour, and makes a most palatable preserve. A few weeks ago Mr. Charles Harries called at my office with a few fruits of this plant, of which he desired the name, &c. I recommended him to try it as a preserve, mixed with melon, for jam-making; a few days afterwards, he sent me a small pot of excellent jam, accompanied by the following note:—"Since seeing you on Friday last about the 'Kei apple,' the information which you so kindly gave me concerning the 'apple's' use for making jam, &c., has been put to the test, and I forward you herewith a small pot of jam which was made from the 'apple' and the melon which I was describing to you. According to the colour of the jam, you would think that colouring had been used, but I can assure you that none was used in making it. I am very sorry I did not come to you sooner for the information, as the crop of fruit is just over and gone to waste." The melon spoken of is the White Gourd (*Benincasa cerifera*), a fruit equally as useful as the pie-melon. In an unripe state, the fruit of the Kei apple is used for pickling.

The plant is one of the best known for hedge-making, for which purpose it must be raised from seed, as it does not strike readily from cuttings. In planting for fruit, layers from female plants should be made. For fertilisation purposes, one male plant would supply pollen sufficient for 20 or 30 female ones.

Although as previously stated, the fruit is a useful auxiliary in the manufacture of preserves, its cultivation on a large scale for this purpose cannot be recommended. The plant was introduced into England in 1838, by the Messrs. Loddiges, and one of these plants (a male) was brought out by my father, who left England for South Australia in the same year.

Plate CXV.

KEI APPLE (*Aberia caffra*, Hook.)

Tropical Industries.

PROFITABLE TOBACCO-GROWING.

By R. S. NEVILL,
Tobacco Expert.

To the question, "Is the growing of heavy export tobaccos profitable, or can Queensland growers compete with other countries in other markets?" the answer is—Yes, if the farmers are willing to adopt modern methods, and conduct their farming operations upon lines followed by other agricultural communities. Not only that, but they can practically monopolise the market for this class of tobacco in these colonies, as it is conceded that, so far, this colony gives promise of being able to produce the best tobacco grown in Australia. Given the soil and a sufficient rainfall, the cost of production in this colony should be less than it is in the United States, for the following reasons:—The Queensland farmer does not require to feed his working stock through a long hard winter, his taxes are little more than half those imposed on the farmer in the United States, and he gets a larger yield than the latter, while the price of labour is about the same.

Ordinarily, the amount of tobacco produced here is not commensurate with the labour performed, and for the reason that the labour is often not properly directed.

It is doubtful if any one crop, to the exclusion of all others, can be made profitable one year with another, employing only one-third or one-half of a man's time, and the balance idle or doing wage work when he can get it. By diversifying the crops of the farm, and making tobacco one of the crops, the farmer does not then depend upon the one crop for the whole of his income and sustenance, and he is sure to get a good price for one or more of his products, besides producing his own food, which he can do cheaper than he can buy it out of his tobacco money.

METHODS.

It goes without saying that the one-crop system requires a higher average of prices to be profitable than that of several crops. By diversifying their crops, the farmers of the United States have found tobacco-growing fairly profitable at 3½d. per lb.

The cost of production in Queensland can be materially lessened by substituting the plough for the hoe, as I have heretofore suggested—a process which will increase the quantity and improve the quality. Improved curing-sheds and improved methods of curing will also give additional weight to the tobacco, besides improving its quality. The labour of transplanting can be much lessened by a thorough preparation of the ground beforehand, by deep ploughing and deeper cross-ploughing, and thorough harrowing, and getting the soil into the best of tilth. By this means a proper arrangement of soil particles is obtained, and the land is in the best physical condition, influencing beneficially both the temperature and the moisture; the free access of air is secured, supplying the necessary amount of oxygen, and the soil is in such a condition of fineness as to allow a perfect root development.

These are all essential to healthy plant life; and when these conditions exist, the farmer will have fewer plants dying from transplanting, and the labour will be materially lessened. It should be evident to everyone that the soil in such condition as to supply, fully, all that plant life demands of it, will give the best results in every particular, and this condition cannot be obtained without the free use of the plough.

USE OF THE PLOUGH.

A cloddy soil will certainly defeat all efforts to get a good and uniform stand in the field, and care should be taken to plough the ground when it is in proper condition. A tobacco-field should be ploughed after each hard rain—after the ground has sufficiently dried, until the plant is too large. When the plants are kept in a perfectly healthy and vigorous condition, they are less susceptible to disease. Pruning, or taking off the bottom leaves in order to allow ventilation under the plant, is also a condition to healthy fields. The amount of water in the soil to produce the best results for heavy pipe tobaccos is estimated to be from 15 to 20 per cent.

"Below 15 per cent. the line of drought is reached, and the methods of cultivation should have for their prime object the maintenance of the water supply above the line of drought, so that the growth of the plant shall receive no check."—*Whitney.*

PRODUCT.

It is important that growers should take notice of these things, for when they seek an outlet for the surplus product they must offer an article quite as good as others, and one which is produced as cheaply. This cannot be done unless the best methods are adopted—the best are the most economical.

The appreciation of the necessity of proper methods, and their adoption, will save fully 25 per cent. of labour, besides giving better and increased results.

The various pests of the tobacco plant can be controlled by the use of Paris green, as a spray, but this must not be used after the tobacco has been topped. It is very effective in the case of the Miner.

The lands best suited to growing heavy export or pipe tobaccos are friable and well drained. Limestone soils, with a small percentage of clay and a large percentage of silt, are the best. Wet or forcing soils will not grow good tobacco, as the product will be rank and woody.

Climate has much to do with the quality, and this can only be determined by experiment. For cigar tobacco sandy soils are preferred, some of the best cigar lands of Florida having 50 per cent. of sand. This is confirmed by Mr. Whitney in his report on the tobacco soils of the United States.

MANURING OF TROPICAL PLANTS.

ORANGES AND LEMONS.

INVESTIGATIONS conducted by Dr. Hilgard* (California) have shown that oranges and lemons remove the following quantities of plant-food ingredients from one acre:—

	Potash.	Phosphoric Acid.	Nitrogen.
1. 20,000 lb. oranges ...	42·2 lb. ...	10·6 lb. ...	36·6 lb.
2. 20,000 lb. lemons ...	53·8 ,, ...	12·2 ,, ...	30·2 ,,

No attention was paid in these tests to the quantities of plant-food ingredients present in the wood and leaves, and as these are by no means insignificant the above figures must be considerably increased if we would obtain the exact supply of plant-food required annually by orange and lemon fields. Results of practical investigations from which to compile figures regarding the total quantity of plant-food are, however, not at hand.

But little material of practical value with regard to the cultivation of these fruits exists, and that is based upon the experience of American planters, no important conclusions having as yet been reached in Europe.

Dr. Woodbridge reports some interesting results, relative to orange fertilisation, obtained from trials conducted at North Pomona, Southern California, which were begun in January, 1893. The plots, each containing 10 orange-trees, were manured at that time, as shown in the table below, the

* Report of the Work of the Agricultural Experiment Station of the University of California, 1892-1894.

applications being repeated in the spring of 1894. On 22nd April, 1895, oranges were taken from each plot. The samples, duly numbered, were sent to the laboratory for analysis. The results of this analysis are given in the table:—

No. of Plot.	Quantities of Fertilisers applied per Acre in lb.	Quality of Oranges.			
		Per cent. of Rind.	Per cent. of Solid Contents in Juice.	Per cent. of Sugar in Juice.	Per cent. of Increase of Sugars over Unfertilised Plot.
1	No fertiliser	40	7·50	8·37	
2	20 lb. nitrogen	39·3	9·01	10·64	27·1
3	50 ,, phosphoric acid	38·2	8·74	10·77	28·6
4	75 ,, potash	36	8·20	9·80	17·0
5	20 ,, nitrogen ... ... 50 ,, phosphoric acid	37·6	7·92	9·55	14·0
6	No fertiliser.				
7	20 lb. nitrogen ... ... 75 ,, potash	37·2	8·71	10·64	27·1
8	50 ,, phosphoric acid ... ... 75 ,, potash	34·0	9·33	11·38	35·9
9	20 ,, nitrogen ... ... 50 ,, phosphoric acid ... ... 75 ,, potash	31·0	9·33	11·52	37·6
10	400 ,, plaster.				
11	? ,, stable manure...	36·0	8·40	9·90	18·0

With reference to these trials, Dr. Woodbridge makes the following remarks:—"The oranges on the manured plot (No. 11) were inferior, the surface being sunken away and soft in many places, and the fruit was soft and somewhat puffy. Plot 2—the nitrogen plot—contained more puffy oranges than any other plot. Plots 8 and 9 were far ahead in general appearance of any oranges from other plots, and plot 9 was of a much deeper colour. The leaves on plot 9, also, showed a much deeper and healthier colour. Especially striking are the facts—1st, that the percentage of sugar was raised 37·6 per cent. in plot 9 in comparison with plot 1, where no fertiliser was applied, and, secondly, that the rind was reduced 22·5 per cent.

Unfortunately, the yields obtained in these trials are not given, and the only conclusion to be drawn is that the mixture applied to plot 9 produces a very beneficial effect upon the quality of the orange and apparently also upon the development of the tree itself.

Observations made in Florida prove that manuring with a complete fertiliser produces excellent results upon the quantity of the yield.

It is interesting to note that Professor Woodbridge's experiments were conducted upon a soil rich in potash, which latter, however, was in an almost entirely unavailable state. Not until the plant had been artificially supplied with the easily assimilable forms of the Stassfurt salts (in this instance with sulphate of potash), was it capable of absorbing such quantities of potash as were needed for the production of good oranges. This observation proves conclusively that the quantities of various plant-food ingredients, found in the soil, rarely correspond to the amounts actually required by the plant, a fact to which sufficient attention is seldom paid.

CULTIVATION AND FERTILISATION OF LEMONS, DUMVILLE GROVE, FLORIDA, U.S.

A lemon-tree yielded from eight to ten boxes of lemons annually. This tree was fertilised during 3 successive years with 40 lb. (per year) of the mixture given below. The fertilisers were put on in three equal applications, in February, June, and November of each year, at a depth of ¾ to 1 foot and at a distance of 1¼ to 6½ feet. They were put into a ditch surrounding the trunk and covered with water, after which the ditch was filled up.

The mixture contained 12 to 13 per cent. potash in the form of sulphate of potash-magnesia, 4 to 5 per cent. nitrogen in the form of sulphate of ammonia, and 4 to 5 per cent. phosphoric acid in the form of acid phosphate, 100 lb. being made up approximately as follows:—

48 lb. sulphate of potash-magnesia.
25 „ sulphate of ammonia.
27 „ acid phosphate (18 per cent.).

Sulphate of potash-magnesia, analysing 27 per cent. pure potash, may be replaced by sulphate of potash, which contains 50 per cent. pure potash.

The trees, when very young, were fertilised with 5 lb. of the above mixture, this amount being gradually increased to 40 lb. per annum, after the trees had reached the age of 8 years.

ORANGE CULTIVATION AND FERTILISATION, DUMVILLE GROVE, FLORIDA, U.S.

The yields of oranges produced were equally as good as those of lemons. The mixture applied was similar to the one used for lemons; except that it contained a somewhat smaller percentage of nitrogen and a somewhat larger percentage of phosphoric acid, the percentage of potash remained the same.

The mixture analysed 13 per cent. potash, 3·3 per cent. nitrogen, and 5 per cent. phosphoric acid, the materials applied being in the same forms as mentioned in the case of lemons; 100 lb. of the mixture contained approximately:—

48 lb. sulphate of potash-magnesia.
16 „ sulphate of ammonia.
36 „ acid phosphate (14 per cent.)

The trees when very young were fertilised with 5 lb. per tree of the mixture, which amount was increased to 20 lb. per annum, after the trees had reached the age of 6 years. The report does not state whether this amount (20 lb.) was to be increased in the following years. The observations were unfortunately brought to an unexpected termination by the extensive frosts that set in towards the end of December, 1894, and in January, 1895; as a result of the frost, this grove, together with the majority of the Florida plantations, was completely destroyed.

MANURING OF TROPICAL PLANTS—PINEAPPLES.

MR. A. H. BENSON writes to correct an impression which might be made by perusal of an article which appeared in our May number, under the above heading, taken from a Florida journal, that a soil which is suitable for pineapple growing in that State would be also suitable for Queensland. In fact, he points out that the very reverse would be the case. He says:—

In Vol. IV., Part 5, pages 374 and 375, under the heading of "Manuring of Tropical Plants—Pineapples," the following remarks have attracted my attention, as, if the advice given by the writer is followed by our Queensland pineapple growers, it is bound to end in loss and failure, as, though no doubt applicable to Florida conditions, it certainly will not do in this climate:—

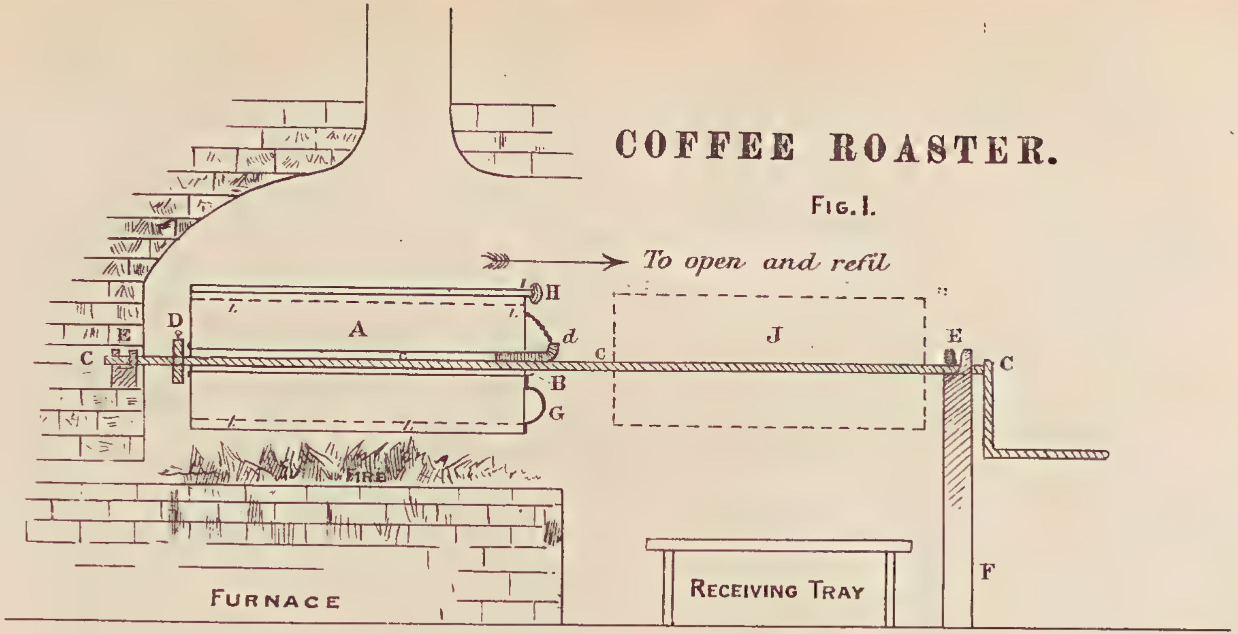
"Sandy loam soils, but rich in humus, and with a hard-pan clay subsoil, are best suited for pineapple culture. . . . . The soil in question contained pretty large quantities of humus and sand at the surface, and had a hard-pan bottom at a depth of 1 to 2 feet."

A soil possessing such a subsoil would be absolutely unsuitable for pineapple culture in this colony, possessing, as we do, a climate subject to heavy rainfalls at certain periods of the year, and at other times to comparatively long periods without rain or with only a small rainfall. The effect of our heavy rains on such a soil would be to completely saturate it, and as the water would have no get-away, it would stagnate, and kill the roots of every pineapple

Plate CXVI.

COFFEE ROASTER.

Fig. I.



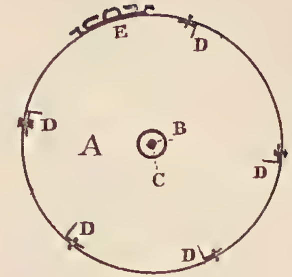


Fig. 2.

DESCRIPTION.

A. Cylinder or Drum of Roaster.
B. Tube through Drum on which Axle Bar works.
C.C.C. Axle Bar.
D. Collar Attachment on Axle Bar.
d. "Key," fastened by small chain to Drum.
E.E. Bearings of Axle Bar.
F. Standard of outside bearings.
G. Handle for removing Cylinder.
H. Sliding Door.
I. I.I.I.I. Strips of thin iron in the form of Paddles inside Drum.
J. Position of Cylinder when removed to Open, Empty and Refil.

A. Section of Cylinder.
B. Axle Tube (B. Fig. 1).
C. Axle Bar (C. Fig. 1).
D. Strips of thin iron to turn Coffee [*see* I.I., Fig. 1].
E. Sliding Door [*see* H., Fig. 1].

growing in it. Perfect drainage is essential to the successful culture of pineapples in this colony, and in cases where such is deficient or there is an impervious subsoil heavy rains are always followed by more or less loss from the so-called pineapple disease, which is mainly, if not entirely, due to the retention of stagnant water in the soil round the roots of the pineapples. A soil such as that recommended would also dry out very rapidly, as after the moisture in the foot or so of soil has become exhausted, there would be no possibility of its being replaced by moisture drawn to the surface by capillary attraction, as the hard-pan would absolutely prevent this taking place.

The nature of the soil—namely, a sandy loam, rich in organic matter (humus)—is well adapted for the growth of pines provided there was no clay subsoil or hard-pan, but instead of this a perfectly free open subsoil; and such a soil would grow good pines here. As to the manure applied, it is a complete manure containing all the important elements of plant food, and its application would be beneficial on any soil deficient in such plant food.

From manurial experiments now being conducted at the Redland Bay Experiment Orchard, I may state that so far a mixture of soluble nitrogenous and phosphatic manures is having a very marked effect on the pineapples to which it has been applied, but as far as I can judge at present potash manures are having little, if any, effect. Full particulars of the manurial experiments now being conducted at Redland Bay will be published in due course, but it is premature to do so now. The experience of such experiments conducted on a typical Queensland fruit soil, and under our climatic conditions, will prove of more value to our pineapple-growers than any experience obtained under totally different conditions of soil and climate in other parts of the world. I have drawn attention to this matter, as I feel it would be unwise for our fruit-growers to attempt methods of culture, &c., that, though of proved merit in other countries and under certain conditions, are quite unsuitable to and unworkable in this colony.

COFFEE-ROASTERS.

By HOWARD NEWPORT,
Instructor in Coffee Culture.

SOME inquiry having been made concerning coffee-roasting and preparation for market on the plantation, Mr. Howard Newport, who has been on an extended tour amongst the Northern coffee-planters inquiring into the position and prospects of the industry, and also advising as to the proper methods of planting, growing, pruning, harvesting, and general manipulation of the crop, in order to ensure success, supplies the following illustration of a useful roaster, together with a full description of the machine. He says:—

Before going into this subject in detail, I would mention that the roasting and subsequent tinning, labelling, and retail selling of ground coffee do not seem to be worth the while of small coffee-growers.

The treatment of the coffee after it has left the huller, winnowing fan, and sizer is a business in itself, and would necessitate more attention and the expenditure of more time than a small grower would be able to spare for it.

I have not the space here to go fully into my reasons for thinking thus, but these will be mentioned in my report on the industry. While readily supplying the information required, I do not advocate, as a general rule, the *manufacture* of coffee by the *grower*.

The Roaster.—A useful size of cylinder is 2 feet external length—which allows for the riveting in of the ends, 9 inches—about 1 foot 10 inches internal length, with about 12 inches diameter. To this is fixed a bar to act as axle, one end of which is bent to form a handle by which to revolve the cylinder. The bar may or may not go through the cylinder; it is often fixed to the discs at the ends merely, but it is difficult in doing this to have them so nicely and

exactly fixed as to allow the cylinder to revolve evenly and truly. In any case, the fastenings should be by means of rivets, and not by any method of soldering.

The majority of coffee-roasters have the bar fastened to the cylinder or drum, either run through it or attached to each end; but by far the most useful method is to have a piece of iron tubing inserted and riveted to the cylinder through which the axle bar can pass; the bar then having a collar attachment at one side to prevent the cylinder going too far back, and being fixed on to the axle by a flat piece of steel running in a shallow slot in the bar, technically called a "key."

The axle bar should be about $\frac{3}{4}$-inch in diameter and about 7 feet long. This length is necessary to allow the cylinder being slipped along, as well as to allow the manipulator to work some little distance from the furnace. The tube running through the cylinder should be just large enough to run freely on the bar.

This method admits of the roaster being easily and quickly worked, since the cylinder can, by the removal of the fixing key, be slipped out of the furnace without the removal of the axle bar from its bearings.

The bearings need not be elaborate, or of brass, specially turned and fitted, though for constant work such would wear far better and last longer.

The door into the cylinder should be a sliding one, and need not be very wide; 4 inches would be enough. It should, however, run the whole length of the cylinder, and not for merely a portion of its length. This, with the cylinder, while still hot, is slipped along the axle bar and out of the furnace; a few revolutions will drop the contents into a receiving tray without handling, and a new lot may be put into the roaster, without having to wait for it to cool down.

The cylinder should be made of $\frac{1}{12}$ or $\frac{1}{8}$ inch iron; $\frac{1}{16}$ inch will do, and roast quicker, but will not last so long, and is more liable to warp in the heat. The lid should be of the same material. Inside the cylinder there should be five or six strips of $\frac{1}{16}$ inch iron, about 2 or $2\frac{1}{2}$ inches high, riveted along the sides at right angles to the ends, and running the whole length of the cylinder. These are to turn the coffee over, to separate beans and mix them and ensure uniform roasting.

The coffee-roaster is not a complicated piece of machinery, and can easily be made locally by almost any blacksmith. The accompanying sketch is rough, but will, I trust, be found useful in explaining any point that may not be clear from the description.

The size of the roaster may be reduced or increased to meet existing requirements, but the length of the cylinder should bear the proportion to diameter as nearly as possible of 2 or $2\frac{1}{4}$ to 1.

A roaster of the dimensions given will take 40 lb. at a pinch, or can be worked satisfactorily with only 5 lb. I would not use a smaller one, however, for a charge of from 20 to 30 lb. I quite agree with the suggestion of a correspondent that a series of small roasters is better than one large one; also, I would add that a series of roastings, even in a small roaster, will be found more satisfactory than a heavy roasting. Twenty pounds, in a roaster of this size, will be found to be more thoroughly and uniformly prepared than 40 lb.

A roaster should be always larger than would *appear* necessary when charged, and should never be even half *filled*. The cylinder should be kept clean. A good way is to wash out with water before use, and then evaporate any moisture there may be, by giving it a few turns over the fire before filling.

It is perhaps hardly necessary, but, since I have seen it done in this colony, I think it just as well to mention that nothing of the nature of oil, butter, or lard should be put into the roaster. The coffee itself contains quite sufficient oil for its requirements, and any deleterious matter of this nature has the effect, sooner or later, of turning the ground coffee rancid.

Once the coffee has been put in, the cylinder should be slipped back into the furnace as soon as possible, fixed by means of the "key" to the axle, and no delay admitted in commencing to revolve. The turning should be regular and not too fast.

The time necessary for a satisfactory cooking will vary according to heat of fire, amount of coffee, and many other things, but very little experience will enable the operator to regulate these matters. A wood or charcoal fire should be used. Coffee when roasted is easily tainted; therefore great care should be exercised if it be found necessary to use a coal or coke fire or gas flames. Gas, if available, is more easily regulated, but a charcoal fire is safest and best.

Coffee should never be allowed to cool in the roaster, but should be turned out as soon as it is done. It is frequently over-roasted. When properly done, the beans should be of a bright-brown or chestnut colour. Those beans that have become a dark-brown or black have lost most of their essential qualities, and make a liquor poor in every way but colour. Caffein is volatile, and over-roasting dispels just what should be retained. A properly roasted bean should be of as light-brown a colour as possible, while still brittle enough to pound into a powder. The roasting should be enough to just convert it from a horny state to a brittle one and no more.

If unsufficiently roasted, the beans, on being broken, will look patchy and will retain the slightly damp feel and look that they have on being turned out of the roaster. If properly roasted, they will very quickly lose this appearance and feel on being exposed to the air. The tray for receiving the newly roasted coffee should be kept in readiness, and the coffee spread out at once and not allowed to stand in a heap. A brass wire gauze bottom to the tray is satisfactory, though not a necessity. A clean wooden tray will do, but cloth should be avoided.

It must be borne in mind that coffee once roasted begins to lose its aroma, and also to absorb moisture and other deleterious substances which may be about. It should therefore be allowed to cool where no deleterious fumes can touch it and taint it. Coffee should never be ground while still hot or warm. If for export, or if it has to be kept, it should be hermetically sealed up in boxes or tins. Roasted coffee, even while waiting a few hours before being ground, will be of better quality and strength if kept in a canister (as soon as cool) with a tight-fitting lid.

COFFEE PRICES.

REPORTS of sales of East Indian coffee between the 9th and 17th ultimo (says *Planting Opinion*) contain some instructive information as to prices. There has been some despondency of late in regard to values of coffee, especially among Mysore men. This, no doubt, has been partially due to a fall in prices of the Mysore berry, resulting from deterioration of quality. What *can* be done is shown by some of the prices lately realised, which afford testimony to the value that the home trade sets on parcels of exceptionally fine quality. A few leading figures will suffice to illustrate our meaning. The following sales are reported:—

				P.B.	T.
COORG.					
Faith	115s.	109s.	98s.	135s.	70s.
Chisholms / Silpikadu	101s.	76s.	...	112s.	50s. 6d.
A. B. Heroor	101s.	75s. 6d.	48s.	111s.	52s. 6d.
Mangles / Allicutty Mountain	100s. 6d. to 101s.	76s. to 77s.	49s.	111s.	50s.
MYSORE.					
Utollalu Mockett... ...	107s.	90s.	69s.	123s. 6d.	65s.

The "Faith" figures are a splendid record—135s. for peaberry and 70s. for tryage; in fact, any of the above sets of figures must surely show that profits are still to be made out of coffee. But we have, of course, given the pick of the bunch. Coorg figures go as low as 75s. No. A, and 98s. peaberry. Mysore 50s. 6d. per bid and 75s. (bid); Nilgiri (of which very little was offered)

ranges from 61s. to 92s. for No. A, while a small lot of peaberry fetched only 80s. Wynaad figures are just about as unsatisfactory, though 102s. was touched for peaberry. Nelliampathy averaged well, ranging from 81s. for A to 103s. 6d. peaberry.

RUBBER.

WITH the march of science, problem after problem in manufactures and in agriculture is being gradually solved, and what appeared at one time to be insuperable difficulties have been successfully overcome, and the only wonder has been that nobody had thought of the method before. Lately we have been assured that the trouble with rhea has become a thing of the past. Now we learn from the report of the Director of the Peradeniya Gardens, Ceylon, that by the help of what is practically a cream separator "pure caoutchouc can be obtained from the milk of any species of rubber-tree, and the product thus obtained is practically identical, whether got from the Para, Ceara, or other species. The best results are perhaps obtained," says the Director, "from the milk of the *Castilloa elastica*, and it thus becomes a question whether the planting of this species should not be taken up in Ceylon in the dry parts of the hills, where Para rubber will not grow."

The *Tropical Agriculturist* of Ceylon, always prompt to give to its readers the latest information on the subject of new processes in the manipulation of agricultural products, gives the following description of the method adopted by Mr. Biffen, who is the Demonstrator in Botany at the University of Cambridge:—

As the rubber exists in particles in the latex, it seemed possible that the centrifugal method of separation might be adopted in examining the phenomena of coagulation. A modified form of the ordinary centrifugal milk-tester was therefore designed capable of being rotated some 6,000 times per minute.

The latex was taken directly from the tree, strained through wire gauze to remove any pieces of bark, and then, if very thick, diluted to about the consistency of their cream. The first experiments were made with the latex of *Castilloa elastica*.

After centrifugalising for from three to four minutes, the rubber particles completely separated as a thick, creamy, white layer from the deep-brown solution containing tannic acid, in which they had been suspended. This layer was taken off, shaken with an excess of water to thoroughly wash it, and again separated. The separated particles were then shaken with water, so as to form an emulsion, and alkalies were added. No coagulation now occurred, even though the mixture was allowed to stand for several days. The particles could, however, be brought into a solid mass by pressure, by gently heating or by drawing off the water with a porous tile.

So prepared, the rubber formed a pure white mass, without any trace of its usually characteristic smell. On exposure to the air for several days, the surface became brown, probably owing to oxidation.

The percentage of rubber in the latex was estimated at the same time by separating 50 c.c. The weight of the dry substance was 12·5 grammes [1 gramme = 15⅗ grains Troy—Ed. *Q.A.J.*], which, as the specific gravity of *Castilloa elastica* latex is practically 1·0, gives a yield of 25 per cent.

On treating the latex of *Hevea braziliensis* in the same way for a slightly longer time, a similar separation occurred. The same purely physical means as those employed in the case of the separated *Castilloa* rubber particles, caused them to coalesce to form a solid mass, while the addition of acetic acid and the action of the smoke of the urucuri nuts had no effect.

The yield of rubber, estimated as before, was from 28 to 30 per cent. The latex of *Manihot Glaziovii* also separated readily, and gave results completely parallel with those mentioned above. The latex is interesting, as it is readily clotted by churning. A soft spongy clot is formed in a few minutes, containing in its meshes the greater part of the solution in which the rubber particles were

suspended. If this clot is cut into slices while still soft, and pressed between sugar-cane crushers or in a heavy press, the bulk of the solution is extracted, and a fairly pure rubber is found. On drying, it does not give off the putrid smell characteristic of the ordinary Ceara "scrap."

In the Queensland scrubs there is a large number of milk and rubber yielding trees, such as all the fig family, and the genus *Excaecaria*, one of which the *E. Dallachyana*, Baill., yields a quantity of milky juice when tapped. This tree was described by Mr. F. M. Bailey, Government Botanist, in this *Journal* (Vol. III., p. 284) as the Scrub Poison-tree, or indigenous "rubber" plant. Two other species—namely, *E. Agallocha*, Linn. (River Poison-tree or Milky Mangrove), and *E. parvifolia*, Muell. Arg. (the Guttapercha of the Gulf country)—are found in this colony. Both trees furnish rubber. The milk on analysis shows 19·61 per cent. of caoutchouc. Certain other trees (*Kicksia* and *Landolphia*) produce excellent rubber when their milk is mixed with that of trees of other species. The new process of rubber extraction might be tried on some of the above rubber-trees, and, if successful, another industry might be entered upon in Queensland with great advantage, at small expense, as the trees are plentiful in our scrubs. Certainly with a cheap method of preparation, the price of rubber may fall very low, but the demand for the article is so great that it should offer inducement to business men to make a trial of the process of centrifugal extraction of this, at present, valuable product.

INDIARUBBER FROM *EUPHORBIA*.

MAJOR C. GIBERNE has made a communication to the *Standard*, in which he states that enormous quantities of rubber are locked up in the jungles of India in the various species of *Euphorbia*, or "milk-bush," with which it is in parts thickly studded. Many years ago when in India, he ordered a box of chemicals from England; and in the course of some experiments he made, he added a little nitric acid to the strong alkaline milk juice of *Euphorbia tircualli*, and, to his surprise, not only was the alkali neutralised, but a piece of Indiarubber was left floating on the surface. He suggested that perhaps a cheaper acid would prove equally efficacious. The milk could easily be extracted from the milk-bush by means of a common native sugar cane press. The only question then would be whether the acid should be brought to the milk or the milk to the acid, and in the latter case, whether it should be sent in the form of a fluid, or be previously dried in the sun, and exported to England in the form of the gum, known in commerce as *Euphorbium*.

VANILLA.

THE vanilla plant (*Vanilla planifolia*) is thus described by Dr. H. A. Alford Nicholls, M.D., F.L.S., C.M.Z.S.*:—"Vanilla beans are the cured fruits of a climbing orchid found growing wild in the hot, humid forests of Central and South America. When the Spaniards conquered Mexico, they found vanilla in use among the Aztecs for flavouring chocolate, and it is used for the same purpose by the English and French manufacturers of the present day."

The vine is now cultivated in Mexico, Brazil, Honduras, Guadeloupe, Réunion, Mauritius, the Seychelles, Java, and Tahiti in Polynesia, but a considerable portion of the vanilla of commerce is gathered from wild plants found growing in the forests of Mexico. In Guadeloupe, Réunion, and Mauritius the plant is cultivated by small proprietors, and many of the householders in these islands make money by selling the pods grown on vines cultivated in their gardens and on the walls of their houses.

*Text-book of Tropical Agriculture, 1892.

SOIL AND CLIMATE.

A rich, vegetable soil, such as is found in the dense forests of the tropics, is the best for the vanilla. Sands are too light, and clays are either too dry in hot weather or too wet in the rainy season. An undrained, water-logged soil will cause the roots to rot, and it is therefore quite unsuited to the cultivation of the orchid. The climate should be hot and moist, and sheltered situations are indispensable, but the plants must not be too much shaded, or the fruits will not ripen.

PROPAGATION.

The plants are raised from cuttings, and it is not necessary to set them in nursery beds to strike root. Cuttings 4 or 5 feet long are planted at the foot of trees or other supports used for the vine to grow on, and if the weather be favourable they will soon take root. The cuttings may be got from any part of the vine; and in cases where it is impossible to obtain a sufficient number of long cuttings, shorter ones may be employed, but the plants will sooner come into bearing if the cuttings be the proper length.

CULTIVATION.

The vanilla vine, as we have seen, requires a support to grow on; and as the fertilisation of the flowers will have to be done artificially, it will be necessary for the plant to be trained so as to bring the flowers within reach of the hand. When the cultivation is carried on in gardens, stone walls, trees, or wooden trelliswork can be utilised for supports; but in cases where the plants are grown on a larger scale, trees will have to be specially planted, or posts will have to be fixed in the ground for the vines to attach themselves to. These posts should be of some hardwood which will not rot in the earth, and to that end the lower portion may be charred and afterwards tarred.

Unbarked log-wood, calabash, or tree-fern stems may be employed, and the portion out of the ground should be about 5 feet high. It is far better, however, that the supports should be living trees, and the best for the purpose is the Physic-nut (*Jatropha Curcas*), which may be raised from seed or grown from live posts, which, if put in the ground in rainy weather, will, in most instances, soon take root. The distances at which the supports are planted should not be more than 6 feet. The holes should be filled in with rich loam mixed with sand and decayed leaves; and if the plantation be in the vicinity of the forest, the rich humus found on the surface of the ground should be used for filling up the holes. The soil must be heaped up so as to prevent stagnating moisture; indeed, it is better to form a bed about 6 inches above the level of the ground, and this bed may be prevented from washing down during the rains by encircling it with a rough wall of stones.

The three lower leaves of the cuttings are removed, and that portion of the stem planted 3 or 4 inches below the surface. The remainder of the stem is then tied to the post or tree by a flat band of plantain fibre, or by a cocoanut leaflet. Round cord must not be used, as it is liable to cut into and injure the green, succulent stem of the vanilla.

The ground over the buried part of the cutting is then mulched with leaves or light brush-wood; and, if dry weather come on, frequent waterings will be necessary, until the vine has taken root.

The ground must be kept free from weeds, and, unless it be lightly shaded by the growing physic-nut trees, it will be advisable in dry weather to keep the roots constantly mulched.

When the vines have reached the tops of the trees or other supports, bamboos may be fixed horizontally from tree to tree or from post to post, and the vines trained along them. The trees must be kept down low, so that the vines do not get out of reach, and the branches must be judiciously lopped, in order to prevent too much shade. No animal or artificial manures should be used, but rotten leaves and vegetable soil may be applied to the roots after each crop is gathered.

FERTILISATION OF THE FLOWERS.

The plants will commence to flower in the second year after planting, and full crops may be expected in the fourth year.

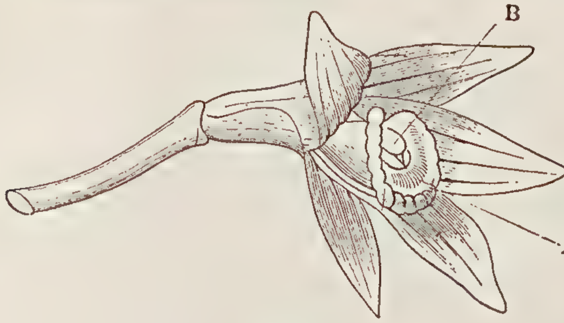


Fig. 1.

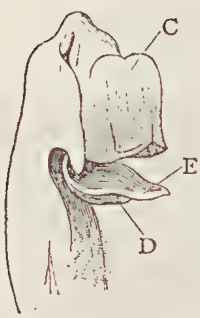


Fig. 2.

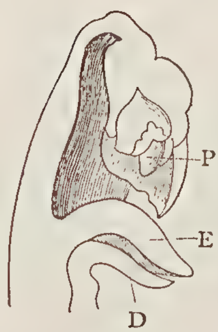


Fig. 3.

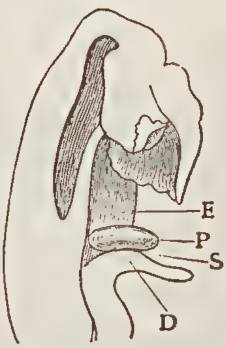


Fig. 4.

A VANILLA FLOWER TO ILLUSTRATE THE METHOD OF ARTIFICIAL FERTILISATION.

Fig. 1.—Flower of Vanilla.
A. Labellum. B. End of Column.

Fig 2.—Enlarged View of top of Column.
C. Anther covered with hood. D. Stigma. E. Lamellum.

Fig. 3.—Enlarged Section through top of Column.
D. Stigma. E. Lamellum. P. Pollen masses.

Fig. 4.—Enlarged Section through top of Column.
D. Stigma. S. Stigmatic surface. P. Pollen mass adhering to viscid stigmatic surface. E. Lamellum pushed up under the anther, which has the hood attached.

In Central and South America, where the orchids grow wild, fertilisation of the flowers is effected by means of insects or other agency. The parts of the flower are so arranged that self-pollination is impossible, and therefore it must be effected by some foreign agency. It is usually said that this agency is an insect one, but none of the writers on the vanilla give any description of the insect, or any particulars regarding it. The author of this book (Dr. Nicholl) once gathered a few vanilla pods from vines growing in his garden in Dominica; and as none of the flowers were artificially fertilised during that year, it is probable that pollination was effected by humming-birds, which were frequently seen to insert their long beaks into the flower for the purpose of abstracting the nectar. It is likely, therefore, that birds may have as much to do with fertilisation of the vanilla orchid as insects. In the cultivation of the plant, however, it will not do to depend upon such precarious agencies, and the planter, in order to ensure crops, must fertilise the plants himself.

If the flower of the vanilla orchid be examined carefully, the outer floral envelope consisting of 3 sepals, and the inner one consisting of 3 petals, may be made out. The lowest of the petals is very different from the others;

it is called the *labellum* or lip, and it envelopes the column or continuation of the axis of the plant on which are set the curious anther and stigma. This continuation is called the *column*, and it and the other parts of the flower are shown in the illustration.

At the top of the column is a *hood* which covers up the anther and pollen masses, and below this is the viscid stigmatic surface, protected and hidden by a projecting lip sometimes called the *lamellum*. Thus we see that the pollen is shut in by the hood, and the stigma is shut in by the lamellum, so that two obstacles prevent self-pollination. The obect of artificial fertilisation is to remove these obstacles, and to permit the pollen masses to approach the stigma.

This is easily effected—firstly, by detaching the hood, which is accomplished easily by touching it lightly with a piece of sharpened wood; secondly, by slipping the lamellum under the anther; and, thirdly, by ensuring contact of the pollen and stigma by gentle pressure between the forefinger and thumb. The operation is performed in a few seconds after a little practice, and it may be facilitated by holding the column between the thumb and middle finger of the left hand, whilst it is supported at the back by the forefinger; the right hand is then free to use the fertilising instrument, which should be rather blunt and flattened at the end. A tooth broken from an old comb and fixed into a piece of thin bamboo a few inches in length has been used by the author in fertilising many vanilla flowers.

CROPS.

If the fertilising operation prove successful, the flower will gradually wither, whilst the pod will grow rapidly. If unsuccessful, the flower will fall off before the second day, and the ovary will remain undeveloped, turn yellow, shrivel up, and drop off the stalk. The flowers come out in February and March in clusters of from 10 to 20, but not more than half a dozen of the cluster should be fertilised; and in this way fine large pods will be secured.

Fertilisation should commence about 9 or 10 o'clock in the morning, for if it be left too late pollination may be incomplete, or fail altogether. The fruit goes on growing for a month, but it will take at least five months longer to ripen sufficiently for harvesting.

The pods are to be gathered when they begin to turn yellow at their ends, or when they produce a crackling sensation on being pressed lightly between the fingers. Each pod should be gathered separately, by being bent to one side, when it will snap off the stem. It is very important to gather the pods at the right time, for, if they be too ripe, they will split open in curing, and if too green they are dried with difficulty, and they will have little or no perfume.

CURING.

After the beans are gathered, they are plunged for half a minute into hot water that is almost boiling. They are then put on mats to drain dry, and afterwards they are spread out on blankets and exposed to the sun. Every evening they are rolled up in the blankets, and shut up in light boxes to ferment. The sunning process is continued for a week, or until the pods become brown and pliable, when they are squeezed between the fingers to straighten them, and so cause the seeds and oily substance inside to be evenly distributed. Should any of the pods split, they should be closed up and bound round tightly with silk thread or narrow tape. As they dry and shrivel, the thread should be unwound, and the pods tied up again. When the pods are brown, the drying process should be finished in the shade, which may take many weeks. Sometimes the beans are slightly anointed with castor or olive oil, but this cannot be recommended, as the oil may become rancid and thus spoil the product.

PACKING.

The dried beans are to be sorted according to their length—the long, thin ones being the most valuable. Beans of the same length are to be tied in bundles of 25 or 50, the ligatures usually being applied close to each end of

the bundle. The latter are then packed in closely fitting tin boxes, which are enclosed in rough wooden cases. In Guadeloupe, the bundles are put into clean kerosene oil tins, which are soldered up to exclude all air and moisture.

We are not aware whether vanilla planting has ever been tried in Queensland except as a curiosity in a botanic garden or by the Acclimatisation Society; but Mr. F. M. Bailey, Government Botanist considers that the plant would thrive in the warm, moist, shady, scrub lands on the far northern coast of tropical Queensland, from Cardwell northwards. We believe that at one time plants were procurable at the Brisbane Botanic Garden, and they have been grown at the State Nursery, Kamerunga.

The late Mr. E. Cowley, then manager of the nursery, said that the vanilla plant suffered there during the winter months. In its own essentially tropical habitat, the thermometer never goes so low as it occasionally does in North Queensland. There were many inquiries for the plant, but he thought that the east end of New Guinea would be the most suitable locality in which to grow it commercially. He recommended the *Plumeria* as the best support tree, and also that the trees should be planted 10 feet apart. The plants at Kamerunga looked very healthy at the date of Mr. Cowley's last report, but none had yet flowered.

HINTS ON THE PREPARATION OF VANILLA.

During the year 1898, 5,261 tins vanilloes were offered for sale in London, and English manufacturers purchased fully 75 per cent. of the quantity disposed of. The London market is the best in the world for quick and complete disposal of vanilloes. At the first auction sales of 1899, 1,095 tins, principall, from the Seychelles were offered, and attracted world-wide attention. Orders were sent from America and many parts of Europe, but the English buyers took two-thirds of the lots sold; brown beans were scarce and dear, whilst good and fine qualities met splendid competition and sold at good prices.

It appears that buyers who had to hold their stocks last year were serious losers, in consequence of the unusually large percentage of vanilloes which deteriorated by mould; many experts considered the goods were hurried forward too soon and not thoroughly cured.

This being a most serious matter, the proprietors of *Planting Opinion* obtained permission from Messrs. Brookes and Green to print the "special hints" which we reproduce here from that excellent journal. The "hints" were published in 1888, but they apply to the harvesting and preparation of vanilla to-day as much as they did 11 years ago.

We wish first, however, to draw the attention of planters and agriculturists generally, in the truly tropical parts of Northern Queensland, to the value of vanilla as an exportable product, to the ease with which it can be cultivated in suitable localities, where the conditions of heat, moisture, and complete absence of frost are found. The real difficulty with this product lies in its preparation for the market, as will be seen later on.

FERTILISATION.

Self-fertilisation in the vanilla (especially some species) to any useful extent is rather an exception owing to the intervention of the reticulum, a portion of the inner face of the style; we have always understood that artificial fertilisation is desirable, the process consisting in removing the pollen from the anthers of the flower, and applying it to the stigma; this can be done with a small camel hairbrush or the anther itself may be applied. This is best done at mid-day in bright weather, but if to avoid the heat early in the day is preferred, only dry mornings should be chosen for the work.

HARVESTING THE VANILLA.

When the pods are ripened, which mostly occurs in Mauritius towards the end of the month of June and throughout July, the work of harvesting commences; the vanilla plants flower very irregularly, and, in consequence, all the

pods are not in fit condition to be gathered at one time, and care is required at the first gatherings not to touch pods which are unripe; if gathered too early the pods or beans will mostly shrivel during the process of drying, and lean shrivelled beans do not realise so good a price in the markets. At the same time the pods must not be left on the plants after they have ripened, or the valves will open, sometimes nearly an inch, and split beans are of inferior value.

DRYING AND PREPARING THE PODS FOR MARKET.

Without doubt the most difficult and anxious time in the culture of vanilla is the process of drying and completing the preparation of the pods.

All the care and success during the early cultivation may easily be lost if through want of knowledge or watchfulness the drying process is imperfect.

The successful operation of drying the beans at the time our information refers to was as follows:—

A large oven (similar to an ordinary bakehouse oven) is heated by fire underneath, until the thermometer fixed on the iron door in front registers a heat of 103 degrees to 105 degrees Fahrenheit. The fire is then withdrawn; meantime pieces of wood should be prepared, laid crossways, to fit the bottom inside the oven, so as to prevent the pods actually coming in contact with the oven; upon these cross-laid pieces of wood about 70 to 75 lb. weight of vanilla pods should be placed, well wrapped in banana leaves, which are again covered with a woollen cloth, and the whole placed in the oven, where they are allowed to remain until the thermometer falls to about 85 degrees Fahrenheit; they are then removed and placed in a wooden box for the moisture to exude and the pods cool gradually; when nearly cold they are placed on blankets, which have been lying on boards and warmed by the sun, and the pods spread on these blankets are exposed to the sun. We have known some growers, who instead of exposing the beans to the direct rays of the sun, prefer to cover the pods with a black woollen cloth, which, by absorbing a considerable amount of heat from the sun as well as moisture from the vanilla pods, assist the process of drying, and, some state, impart to the pods a superior flavour and colour than they otherwise would have. After thus being exposed for 2 or 3 days they should be of a dark-brown colour. The pods are next laid on perforated shelves in an airy room, where they are allowed to remain for 2 or 3 weeks, or until properly dry, when they should be of a good black colour.

SORTING AND PACKING THE BEANS IN LENGTHS AND QUALITIES.

We find all merchants are careful in keeping the size of the beans in the bundles arranged regular and even, and also the weight of the bundles are fairly correct, and upon these points they do not require any information, but we often notice the tins contain very mixed sizes; for instance, one-half of the bundles will measure 6 to 7 inches, and the other 4 to 5 inches. This is a mistake, and where practicable should be avoided. If the parcel in hand is large enough for careful division, the measurements of the bundles in a tin should not vary more than ½-inch, or 1 inch at the outside, thus 8 x 9 inches together, 7 x 8 inches, 6 x 7 inches, 5 x 6 inches, &c.

In bundling the beans we are well aware that it is easier to make the tie with damp rafia than when the fibre is dry, but the former should not be allowed on any account. We have seen bundles of vanilla arrive in London quite mouldy round the tie, caused, we feel certain, by the rafia being damp when used for tying the beans together. This, we feel sure, only requires to be pointed out to be avoided in future.

Bundles of split beans should always be sent in separate tins by themselves, and not mixed with sound beans, as this prejudices the sale; we found this mixture in some parcels we recently inspected.

PRICES OF VANILLA.

In Messrs. Lewis and Peat's "Fortnightly Prices Current," London, for 14th December, 1898, vanilloes are quoted as follows:—

		Inches.		Per lb.
Mauritius and Bourbon	1sts. Good crystallised ...	$8\frac{1}{2}$ to 9	...	14/6 to 24/-
	2nds. Foxy and reddish ...	$4\frac{1}{2}$ to 8	...	12/- to 14/-
Seychelles, 3rds.	Lean and inferior ...		...	7/- to 10/-

Messrs. Brooks & Green in their special Madagascar and Mauritius Prices Current quote present values:—

	Inches.	Per lb.
Very fine black beans, mostly frosted ...	8 to 9 ...	26/- to 29/-
" " " ...	7 to 8 ...	25/- to 26/-
" " " ...	7 to $7\frac{1}{2}$ ...	23/- to 24/-
" " " ...	6 to 7 ...	21/- to 22/-
" " " ...	5 to 6 ...	21/- to —/-
" " " ...	4 to 5 ...	20/- to —/-
Fair to good black beans, part frosted ...	8 to $8\frac{1}{2}$ ...	24/- to 26/-
" " " ...	7 to $7\frac{1}{2}$ ...	21/- to 23/-
" " " ...	6 to 7 ...	20/- to 21/-
" " " ...	5 to 6 ...	19/- to 19/6
" " " ...	4 to 5 ...	18/- to 19/-
Brownish beans in good condition, well frosted	7 to $7\frac{1}{2}$ ...	18/- to 20/-
" " " ...	6 to 7 ...	16/- to 18/-
" " " ...	$5\frac{1}{2}$ to $6\frac{1}{2}$ ...	14/- to 15/-
Ordinary brown beans, part dry	7 to 8 ...	17/- to 20/-
" " "	5 to 7 ...	14/- to 17/-
" " "	3 to $4\frac{1}{2}$ ...	10/- to 15/-

Forestry.

THE USES OF FORESTS.

A Plea for Forest Conservancy in Queensland.

By J. W. FAWCETT.

A question of great importance to Queenslanders, one which is daily growing of more importance, and yet one of which very few individuals ever dream or think, is that of the conservation of our native forests, the protection of our valuable native timbers, and the provision of supplies for the future.

Before dealing with these matters, I should like to give the readers of the *Queensland Agricultural Journal* a few salient points on the uses of forests in general.

"The Uses of Forests" is a subject which very few persons, on this continent especially, seem to take any interest in, yet they play a most important part in the wellbeing and welfare of the earth and of its inhabitants. They have uses in nature not usually thought of. These uses may be arranged as follows:—

1. They are generally beautiful to the eye, and hence relieve the monotony of what might otherwise be only a bare landscape.
2. They shelter the land against piercing winds and render it capable of being cultivated and growing such crops as require a warm and sheltered locality.

3. They have a great effect on the climate of a country, modifying, or rather averting, destructive torrents of rain, and increasing or regulating the rainfall.
4. They furnish timbers, dyes, medicines, &c.

Man is a destructive being, and his destroying power is, perhaps, nowhere so well shown as in the wholesale cutting down of large tracts of timber in various parts of the world. Thinking only of himself and his present wants, and reckless of all consequences, the timber has been, and is being, wantonly and wilfully destroyed. It is sad, very sad, to think what mischief and what desolation has been wrought in the fairest countries of the world by the reckless, wanton, wilful, destruction of forests. Persia, the whole Indus valley, the valley of the Euphrates, Palestine, and, above all, Lesser Asia, have each of them suffered grievously from this waste. Lesser Asia, which the ancient Greeks looked upon as the garden of the world, is now subject to droughts like that which not so very long ago spread death throughout whole provinces. It is the same everywhere—in Europe, Asia, Africa, America, and Australia. In many countries the evil effects of this clearing of extensive tracts of timber has been followed with direful results, and strenuous efforts have been, and are being, made to try and remedy the serious consequences of such wanton folly. France, India, and the United States, amongst other countries, all have made extensive forest clearings on the spur of the moment, and without the least thought of what might follow. A time came when they saw the folly of their systems of total forest destruction, but not before they had suffered severely and bitterly regretted the consequences which had arisen, and that they had not taken steps to prevent such destruction at an earlier period. They started to remedy the defects by forest conservancy, and good and great have been the results. In France replanting began at a great rate, and is still being carried on to the public good. In India a whole "service" was formed to manage the forests, to take care that they are cut judiciously, and to see that new plantations are always made after a clearance, in order that the furnaces may be kept in fuel without any risk of entirely stripping the country of its timber. In the United States, laws against the reckless destruction of the forests have been made. The effects of this wanton destruction of forests have been felt in Australia, and several of the colonies have awakened to the folly of the system, and have gone in for forest conservancy.

France was the first to see the foolishness of destroying her forests wholesale, and I shall give a few brief remarks of how she suffered and of what she has done to alleviate those sufferings. In the South of France the land is cut up into small properties of only a few acres each. The peasant farmers cleared away every tree until there were whole districts without even as much as a single one. After this was done it was found that, though he got a few more square yards of ground for his crops, the gentle showers, which hitherto had fallen regularly, were few and far between. Droughts become more frequent, and when rain did fall it came down in such torrents that destructive floods were caused, which carried destruction and desolation before them. In the mountainous districts after the wholesale cutting down of the timber, the rain, when it fell, wrought terrible havoc. There were no trees to check its action, and consequently the soil was washed away, until in many places, which when the trees were standing had been fertile patches, the bare rocks were exposed. When the wanton destruction of timber was going on, a Frenchman named M. Becquerel made careful observations on the climate, and advocated the retention of the trees. But, like a class of similar men in other parts of the world, the French peasant would have his own way. For years M. Becquerel studied and observed and advocated, but to no use. At last in 1850 he published a book on the "Effects of Forests on Climate," which met with great approval, and many who sided with him, and with those who had been his fellow-workers, joined in such a loud cry against forest destruction that people got frightened, and began to replant at a great rate, and with good results.

Napoleon III., in the earlier part of his reign, advocated the planting of trees, and the Government planted a part of the Gascon "*Landes*," towards Arcachon, and a good deal of the Sologne, with firs. Napoleon had, however, many who disbelieved in the effects of forests on climate or in forest conservancy to contend with, and prominent amongst them was M. Fould, the Imperial financier. Napoleon's Governments, as we know, were expensive ones; the revenues always showed a deficit, and all kinds of expedients were resorted to to raise funds without increasing the taxation. One day in 1865, when the Emperor and his Minister were conversing upon money matters, Fould asked—

"Why not sell the Crown forests?"

"Because, if we do, the buyers will cut most of them down; and then what are we to do for wood?" replied Napoleon.

"Burn coal; having a long bill with England will strengthen the *entente cordiale*," was the Imperial financier's answer; and to try if possible to get Napoleon to sanction such a transaction, he actually got one of the many *venal savants*, of what is now known as the Second Empire, to write a book, in which it was proved that forests had no appreciable effect upon climate. The *savant*, however, had some conscience, and was obliged to confess that the cutting down of the trees did cause that *ravinement—i.e.*, sweeping away of earth and seaming the hill sides with channels—from which so many *communes* (districts) in the south of France (and not there only) have suffered, but he stoutly denied that forests had any effect in increasing or regulating the rainfall. Public opinion was too strong for the scheming financier, and his end was not gained. Since then schools of forestry have been formed in France, where series after series of conclusive experiments have been made, and the reports of the directors of those schools and of the inspectors of forests all bear testimony to the important effect that forests have on climate.

From these reports let me tell you something of the use of forests in their effect on climates. Forests have a fourfold effect on climate and rainfall, as follows:—

Firstly.—There is the chemical action of their leaves which decompose the carbonic acid of the air, fixing the carbon in their woody tissue, and liberating the oxygen.

Secondly.—There is their physical action in hindering evaporation and stopping currents of air, and in covering the ground with a vegetable mould which holds water like a sponge.

Thirdly.—There is the organic action of the leaves which, in breathing, restore to the air a part of the water which the roots have drained from the soil.

Fourthly, and lastly.—There is the mechanical action of the roots, which at once prevent the earth from being washed away by rain, and also enable the water to filter down deep into the ground.

From these four actions we can see that forests ought to make a country cooler, by withdrawing the carbon from the air; for the heat that is set free when wood or timber is burned is the very heat that was being absorbed while the tree was growing. A forest may thus be looked upon as one vast condensing apparatus for storing up the heat of the atmosphere. This is what theory says—and experiment confirms it.

The mean temperature of a well-timbered country is always lower than that of a similarly situated treeless country; but—and this is a most important matter—the cold is less extreme, as well as the heat, and changes of temperature are gradual.* Of course, since rain comes because the air is too cold to hold its moisture any longer in solution, there ought to be more rain in a wooded than in a treeless district. So there is, and in France this has been found to vary from 6 to 8 per cent. Bare soil soon gets heated, and it heats the

* This is the cause of the extremely cold weather of the past few years in many parts of Queensland—viz., the total destruction of our forests and scrubs for agricultural purposes.—J.W.F.

surrounding air. This expands, rises, and absorbs, without condensing them, the vapours brought by the sea winds. Rain only comes in such a district when a contrary wind meets this hot current, packs its layers one on another, and, as it were, squeezes out the wet from them. Hence such rain, due to "atmospheric perturbation," generally comes floods, and *not* like the gentle natural rainfall of forest land. Storms are rare in timbered countries, the electricity of the air being gradually drawn off instead of accumulating. Hail especially is more rare in places which are well timbered than in those where trees are few. Hail is caused by the very rapid evaporation of rain passing through an exceedingly dry stratum of air. Evaporation, we know, always causes cold (this is the principle of water-coolers, &c), and in this case the latent heat of the rain is withdrawn so rapidly that the result is frozen raindrops. Hence, in timbered districts, where the rain is always moist, the evaporation is slower, and rain falls instead of hail. M. Cantégoil, Inspector of Forests at Carcassonne, in France, has made some important observations concerning the effect of hailstorms on forests. In France many of these storms are very destructive to property. He found that they generally made a leap over a forest. Take, for instance, a hailstorm which swept over the department of Ariège early in June, 1874, and entered that of Aude. As soon as it reached the forest lands the hail totally ceased, but when it reached the treeless department of the Eastern Pyrenees it began again with great fury, yet there was electricity enough in the air over the forests, for several fir-trees were struck and shivered to pieces.

Those who in this colony live in the neighbourhood of forests or well-timbered lands, will notice that just after nightfall the air has a soft warmth, quite different from the cold chill that comes on after a hot dry day in the open plains and bare untimbered districts. The reason is this—evaporation and radiation of heat are five times greater in treeless districts than in timbered ones. Perhaps some reader will say, and I fancy there must be a good many of this class in Queensland as elsewhere, if the trees bring more rain, they use up more than the treeless ground, for their roots drain the soil, and their leaves drain the atmosphere. This is not so, for though wood is more than half water, the amount of water contained in all the timber in a forest is the veriest trifle compared with the rain that falls on it during the year. Experiments show that the amount of water decomposed by an acre of forest is very much less than that required by an acre of cabbages, or clover, or wheat. Again, people argue that because pines and other trees dry up marshes, the number of trees in a place must lessen the water supply. This, again, is not so. Experiments prove that this drying up is not due to evaporation through the leaves, or to the water being in any other way sucked up by the trees. All the trees that have this property can, and do, grow and thrive also in dry hungry soils. What they really do is this: They drain the soil, by virtue of their spreading roots, which enable the water to run off into the lower strata.

From what I have already said, it may be seen that forests lower the temperature, while they prevent extremes, and increase the rainfall, at the same time that they regulate it and keep off those deluges of rain which cause sudden and destructive floods. Floods do occur in well-timbered districts; but they are not floods like those in bare treeless districts, which fill the rivers to overflowing, and either scatter a mass of sand and shingle over the flooded lands and ruin it, or wash off all the best of the soil. From careful observations made in Savoy and Auvergne in France, it was found that wherever there were woods, or even quite recent plantations of trees, made terrace-wise along the hill sides, so as to cut across the torrents, and force them into a zigzag, the rains did little harm; but where the mountain and hill sides were bare, the roads and bridges were swept away in all directions, and the fertile lands in the valleys were covered with sand and shingle. The peasantry soon saw the force of this, and began tree planting with most beneficial results. By tree planting they were able to save Embrun, at the mouth of the valley of Sainte Marthe, in the High Alps. This stream, after rains, is a raging torrent, and annually brought down millions of tons of rocks and sand, depositing them on the fertile

lands, and destroying numerous houses. In 1865 the peasants began planting trees in its wide torrent bed. They raised over 200 little dikes or ridges, and planted them with quick-growing trees and shrubs, whose roots so consolidated the earth, that now there is practically no torrent at all. After heavy rains the water, of course, rises; but it no longer whirls down sand and shingle and huge masses of rocks with it.*

These, then, are the two great uses of forests:—*One*, to increase the rainfall; *two*, to prevent it from coming in devastating, desolating floods, instead of in fertile showers. These two are of great importance in Queensland, and require to be looked into more fully by our councillors and legislators.

Will tree planting bring rain to rainless districts? I fancy I hear some reader ask. Yes; I answer, it will. Trees draw the moisture from the air, and cause it to rain, and I have already shown that there is more rain in a timbered district than in a treeless one. But I will give two examples of the presence of trees causing the rainfall to increase. Egypt is almost what might be termed a rainless land, for its rainfall is very small. Years ago, Mehemet Ali, the Ruler of Egypt, ordered a great number of mulberry-trees to be planted in the country. Since his time, millions of these trees have been planted. Their presence actually brought rain, and increased the scanty rainfall, and the plantations here and there along the Suez Canal are producing the same effect. In the forest of Montant, in the department in the Aude in France, a stream used to turn a whole string of fulling-mills. But the land was disforested, and the whole of the trees were cut down. At once the water supply became so irregular, that the mills were stopped for a considerable part of the year. The mill and land-holders at once replanted the forest, and as soon as the trees grew up a little, the water supply was so improved, that the mills were enabled to run again all the year round. Again, in the Black Mountain District, in the same province, observations were made in two valleys—one wooded, the other treeless. After rain, there was much less water from the first, but it lasted much longer, and did not all run away in a flood as did that in the other. There can, therefore, be little doubt that whilst we shall never be able to get rid of floods, or to prevent them, their violence can be greatly lessened by letting the water down gradually if a stop is put to the dreadfully wasteful denudation of our forests and scrub lands which at present exist in Queensland.

Some may argue: "But we *must* cut down the trees to get the land for cultivation." Just so. I do not advocate that no trees should be felled, for as we may have too much of a good thing, so we may have too much forest. If we look at the past history of some of the European countries, we may see this:—Gaul (the present France), in Julius Cæsar's time, 1,900 years ago, was far colder than what it is now, because both it and what is now Germany were, to a great extent, one vast forest. In those days, the river Rhine used to be regularly frozen hard enough for troops to march across. From the same cause England and Italy were colder than they are now. Too many trees are nearly as bad as none at all. Western Africa and portions of South America are pestilential, because the soil is so saturated, owing to the thick forests, and consequently small evaporation, that it can hold no more, and the rains cause marshes, which last from one rainy season to another.

What I advocate is forest conservancy whereby the following different matters should be attended to:—

- The wanton wilful destruction of our useful timber trees should be stopped.
- That a system should be adopted by which only certain trees should be cut down, and that this should only include such as are of no value commercially.
- That noxious trees should be cut down and replaced by valuable species.
- The planting of indigenous timber trees on our timber reserves and waste lands.

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* If the forest and scrub were allowed to grow thicker and heavier along our river banks it would lessen the evil effects of the flood waters which so frequently occur in this colony—J.W.F.

The introduction and planting in forests or plantations of valuable timber trees of other lands which will thrive in this colony.

That laws be promulgated setting out the sizes over which certain timber trees now becoming scarce should only be cut, and that such laws be *strictly* carried out.

To these others could be added.

The wanton destruction of our valuable native timbers, in many instances the wholesale and unnecessary wiping out of certain species in certain districts, is a grievous shame and disgrace to each individual Queenslander as well as to the colony. Not only is it a useless, but a wicked, waste to denude this fair land of ours of the trees which are (though looked upon by most people as useless encumbrances) placed here by a greater and far-seeing Power than is given to such poor mortals as we are to understand. Trees are living things, working for the good of the common weal, and if we recklessly destroy them we lessen the sum of national life, and therefore the amount of national power.

It is easy to make a place treeless, but, oh! so hard and difficult to reclothe it. Let us then as a people be not so wasteful with our forest wealth: it will not last for ever. It was here when we came as interlopers into this country, and we have had, and are having, the use of it. But it will have an end. Our children and their children require it, and how can we hand it on like a legacy if we do not plant and strive to keep up the supply equal to the demand. Forests do not grow in a year, but trees, once they start, grow till they die. The great question now is: "Will the supply of timber here at the present last until a new supply (planted now) is ready to take its place?" I THINK NOT. I trust that our legislators will look at once to the formation of a Forestry Board and the establishment of forest conservancy, and let each one who has land not forget the old Scotch motto—"Be ye aye sticking in a tree, Jock; it'll aye be growing when ye're sleeping."

A LESSON FROM AMERICA.

WE have often been told by people who have read our many articles on forest conservancy, that Queensland can always get an abundant supply of timber from the United States. We know that as they do not keep themselves posted up in American literature on the subject, we fail to convince them that the pine forests of the United States and of British Columbia are so far from being inexhaustible that the question of a timber supply for home consumption is seriously engaging the attention of the two Governments. We give here a paragraph taken from the *London Standard* on the demolition of the forests of the North Eastern or New England States of North America. The "Down Easters" are awakening to the fact that their timber supplies are growing short, that the rainfall is decreasing, their lakes drying up, and the agricultural interests seriously imperilled:—

"A strong effort is being made in the United States to arrest the demolition of the forests of the country, which has been proceeding at an alarming pace for a great number of years. According to a statement issued by the American Newspaper Publishers' Association, the denudation of forest land in the four States of Maine, New Hampshire, Vermont, and New York is progressing at the rate of 1,700 square miles per annum. If this goes on without check, it will not be many years before the timber supplies of the country will grow short, and this is only one point for consideration. In consequence of denuding the country of trees, it is said the level of important rivers and lakes has been steadily declining, and some of the North Western lakes have been dried up. Another result is a decrease in the rainfall, seriously injurious to the agricultural interest. Canada, it is pointed out, has a vast area of forest land, and would supply the United States liberally with timber if a mistaken tenderness for the interests of American lumbermen had not led to the imposition of a heavy duty upon Canadian lumber."

General Notes.

THE KOLA NUT TRADE.

Most people are acquainted with the Kola nut tonic, so universally sold as a "soft drink" in this colony, but few know much of the great esteem in which the nut is held in the Soudan. As an article of commerce in Central Africa, it far and away exceeds in importance every other article of commerce throughout the whole of the Western and Central Soudan. Mr. C. H. Robinson, in an article on the Kola nut, in his book "Hausaland," says:—

Though not found originally in any part of the Hausa States, there is nevertheless no village or hamlet, however small or remote, in which it is not constantly used. The Kola nut is the product of a tree called *Sterculia acuminata*, which is found in the greatest perfection in the country to the back of the Gold Coast Colony. It is also found as far east as the River Gambia, and, with more or less frequency, in all the intervening country.

The fruit resembles a large-sized chestnut, and is encased in long pods, each containing 4 or 6 nuts. It grows like chestnuts, in bunches of 3 or 4 on the tree. Round the Kola nut there is usually a black line, sometimes two, at which it can be divided or subdivided. The colour is generally brick-red, though in some countries, especially in the Far West, there are all sorts of intermediate shades between red and white. In the country of the Bambarra tribe the Kola nuts play an important part in private and public life. The colour in this case has a special significance: a white kola is always a sign of friendship and hospitality, whilst proposals of marriage, acceptances or refusals, defiances, declarations of war, &c., are conveyed by the sending of a number of kolas of the prescribed colour.

The Kola from Gandja, which is of a uniformly red colour, is the one most frequently brought to Kavo (the capital of Central Soudan), as it keeps better than any other. The most minute care and attention on the part of the merchant are necessary, in order that the Kolas may reach the market in good saleable condition. They are carried for the most part in Kavo-made baskets, each of which contains 3,000 or 4,000 Kolas, whilst two of them form a donkey-load. If treated with the utmost care the nuts may be preserved fresh for 2 or even 3 years, but in order to secure this they must be kept constantly damp. If exposed to the air and allowed to dry the Kola opens along the black line mentioned above, wrinkles, and becomes as hard as wood. In this condition it has lost 90 per cent of its value. During the march the nuts are packed in baskets and covered with fresh green leaves. Every 4 or 5 days they ought to be repacked, in order that the leaves may be renewed and that the nuts which are touched with mildew may be removed.

The large profits obtainable on the sale of those which reach the various markets in good condition compensate for the risk and trouble of their carriage. At Gandja the average nut costs 5 cowries; at Say, on the Middle Niger, 70 to 80 cowries; at Sokoto, 100; at Kavo, 140 to 250; at Kuka, on Lake Tchad, 250 to 300.

What, then, one may naturally ask, are the peculiar virtues of this fruit, which forms by far the most important article of commerce in the Central Soudan? The fact that for generations past it has been eagerly sought after by rich and poor alike, and that men will constantly spend the last cowries they possess in buying one to chew, seems clearly to show that it is something more than a mere luxury. The scientific analysis of the nut shows the existence of a large quantity of tannin and of an alkaloid analogous to theime and caffeine. The natives believe that it keeps off the pangs of hunger and enables them to work for long periods without food. As a stimulant, it takes the place which tea

and coffee occupy with us, both of these being here practically unknown. Owing to its extremely bitter an dunpleasant taste, we were prevented from giving the sustaining properties of the Kola a fair trial. On the occasions when, through lack of food, we would gladly have made the experiment, we were unable to obtain the nut. Whatever its real virtues may be, it is certain that the commercial value of Kano is to a very large extent dependent upon the millions of Kolas which its market contains.

On one occasion I met a native caravan consisting of about 1,000 men, together with a large number of donkeys, carrying Kola nuts up towards Kano. The value of the nuts in the caravan, which was only one out of several that annually come to Kano for the same purpose, was little less than £100,000 sterling. The whole of this immense trade is at present in the hands of natives, as the course of the Niger is not such as to allow of the Kolas being carried by water any part of the way.

AGRICULTURAL CONFERENCE.

THE third Queensland Farmers' Conference will be held at Mackay this year, commencing on Monday, 26th June. The first Conference was held at the Queensland Agricultural College, Gatton, on the 10th, 11th, and 12th June, 1897. The second, the Agricultural and Pastoral Conference, at Rockhampton, on the 11th, 12th, and 13th May, 1898. Both the Conferences brought together a large number of delegates from almost all centres of rural industry in the colony, and were productive of immeasurable good to farmers, planters, pastoralists, and horticulturists.

SLOVENLY EAR-MARKING.

A TASMANIAN correspondent of the *Australasian*, who complains of the serious losses of sheep from the paddocks of which sheep not a trace is ever found, sends the accompanying sketches of what he properly calls ear disfigurements:—

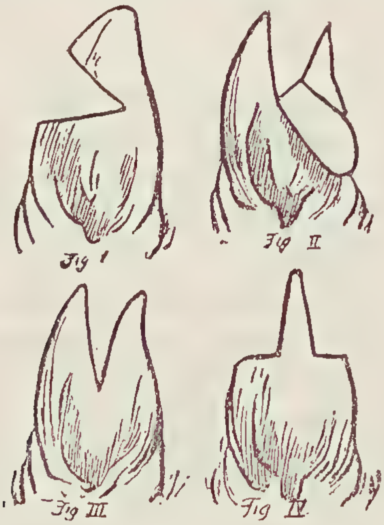
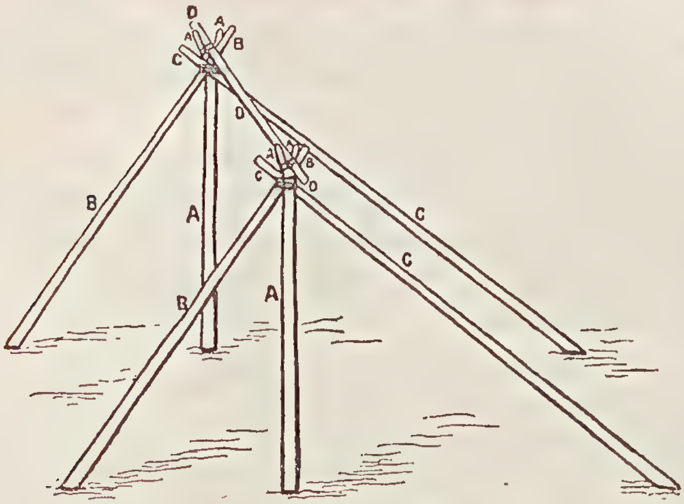


Fig. 1 is called the gap; Fig. 2, the split (sometimes there are two splits); Fig. 3, the tongue fork; and Fig. 4, the bayonet. Like all experienced sheep-farmers on the mainland, he is of opinion that a registration of ear-marks would be beneficial.

MOSQUITOES.

A ZANZIBAR paper says: Throw a bit of alum about the size of a marble into a bowl of water, and wet the hands and face and any exposed parts lightly with it. Not a mosquito will approach you. They hum about a little, and disappear.

SHED FOR REAPER AND BINDER.



The above shows a frame made of saplings, over which a tarpaulin may be thrown to completely cover and protect a harvesting machine. A are two upright saplings with forks at the top through which a crossbeam D is laid. B and C are saplings which both stay A and hold the tarpaulin in position. This framework may be erected at the side of a crop in an hour's time. By having it in such a position the machine may be under cover every night and need be driven no distance, as the shelter may be immediately next the crop. On large estates this plan will save the labour of building a shed, for on these holdings the cultivation paddocks are frequently some miles from the homestead. The framework may be rendered perfectly secure by sinking the saplings some distance in the ground and binding wire round the joinings at the fork.

TURKEY HENS AS MOTHERS FOR CHICKENS.

Has anyone tried the turkey hen for the purpose of hatching out chickens? In France this plan is much in vogue. The turkey hen can cover as many as 30 eggs, and hence would appear to be a more profitable agent for providing large broods of chickens than the ordinary hen.

AGRICULTURAL EXPORTS FROM AMERICA.

Amongst the exports from the United States of America, the agricultural are of the greatest value. In 1898, according to the figures published by the American Bureau of Statistics, the exports of agricultural produce amounted to 851,922,450 dollars, which means, in sterling money, £177,483,800. And yet the States are federated! A united country which can export farm products to such an extent should be a shining example of the prosperity which accompanies federation on sound principles.

TO PICKLE CHILLIES.

Take large green capsicums and slit them sufficiently to remove the seeds. Then make a brine of salt and water of sufficient density to float an egg. Place the chillies in this when the brine is cold, and let them remain there for twenty-four hours, then drain again, rinsing in cold water; then place in wide-mouthed stone or glass jars. Now take vinegar and water in the proportion of 1 quart of vinegar and 1 quart of water to every thirty chillies. Heat to boiling point and pour it over the peppers in the jars; leave it to stand till cold, then drain off this

vinegar and water and throw it away. Heat fresh vinegar now without water, and pour it over the peppers boiling hot. Cover the jars tightly and set in a cool place.

We find many recipes which must commend themselves to dwellers in a hot country in the excellent *Journal of the Jamaica Agricultural Society*. The Chilli pickle is one; another is—

TO MAKE CHILLI SAUCE.

Take 1 dozen large tomatoes, 2 large onions, and 4 green chillies; peel the tomatoes and onions, and chop them up fine, also chop the green chillies fine. Keep them all separate till chopped, then mix and stir all together, adding two table spoonfuls of salt, two table spoons of sugar, one of cinnamon, and three tea cups of vinegar. Boil the whole steadily and slowly about an hour and a half, stirring well all the time. Then bottle.

TO MAKE CHILLI VINEGAR.

Take, say 50 chillies to 1 pint of vinegar. Mash the chillies, then place them in a close jar or wide bottle, adding the vinegar, then cover tightly. At the end of four weeks uncover, strain, and bottle.

CREOLE PICKLES.

Ingredients.— 3 or 4 cucumbers, 8 or 10 onions, 1 or 2 young spadices of cabbage palm, 1 or 2 green pawpaws, a few cut open peppers, a little whole allspice, Coleman's mustard, 2d.; curry powder, 2d.; turmeric, 1d.; black pepper and salt in proportion, and enough vinegar to cover the whole. Mode—Cut up the cucumbers and onions, and soak in salt and water the day before, cut up the pawpaw and cabbage and boil each one in salt and water, but only until they break easily. Put the vinegar into a saucepan, and when it boils put in the cabbage and pawpaw and add, in a little while, the cucumber and onion, spices, and ground black pepper. Mix the mustard, curry, and turmeric with some cold vinegar, and add this to the boiling vinegar, and let all boil for a few minutes. Bottle and cork tightly when cold. N.B.—This quantity will make from 6 to 10 bottles.

The same journal gives the following very good—

HINTS ON PICKLING.

If your family must and will have pickle, see to it that none makes its appearance upon your table which does not at least possess one virtue—that of being home-made. The making of this appetiser requires great care and patience—more than is generally thought worthy of applying to it; and in order to obtain desired results by more speedy methods, the dealer often resorts to reprehensible means. When tempted by the array of bottled pickles which the grocer assures you are "perfectly pure and superior to the home-made ones," recall to mind that nine times in ten the beautiful green, which is so pleasing to the eye, and the crispiness so agreeable to the palate, have both been obtained by a questionable process—the colour, by boiling the vinegar in brass or copper vessels, thus forming an acetate of copper; or, as is often done by the more unscrupulous, by adding that salt itself to the pickles; the crispiness is the result of the free use of alum, which, when used in any but very small proportions, is injurious. Although everyone who eats store pickles is not poisoned, yet very many serious, and often fatal, accidents have followed in the wake of their consumption. Even when home-made, their wholesomeness is questionable, yet if prepared with great care, and eaten judiciously, they are a very agreeable addition to our food, and are considered provocatives to appetite. In the first place, use none but the best vinegar, and heat it in a porcelain vessel—under no circumstances use metal. Bring the vinegar to the boiling point only, as actual boiling will weaken it, and thus destroy its preservative powers. But be sure that it has reached the boiling point and will scald

the pickles, or the latter will be insipid. Never use raw vinegar—it becomes ropy and does not keep well. Bits of horse-radish will assist in preserving the life of the vinegar. A little mustard seed is an improvement to the various chopped pickles and mangoes, but must be used sparingly. Ginger is the most wholesome of the spices commonly used in pickling; cloves are the strongest, mace next, then allspice and cinnamon. A good rule for spicing is to allow a level teaspoonful of whole black pepper, the same of allspice, a tablespoonful of stick cinnamon broken into bits, half-a-teaspoonful of cloves, mustard seed, or horse-radish, and a small piece of ginger root to one quart of pickles. Garden peppers may be used instead of black peppers, in the proportion of two rings of green and one of red (no seeds) to one quart of pickle. Many persons prefer to boil the spices of whatever kind in the vinegar. A dry wooden spoon should be the only instrument used in handling pickles, either in making or when in the jars. The colour of cucumber pickles may be retained by steeping grape leaves, or those of cabbage, spinach, or parsley in the vinegar, through which the colour will be imparted to the pickles. In putting away pickles, never use jars or other vessels which have held grease of any sort, and be very careful to store them in a cool, dry place. Although most housewives in these days put up their cucumber pickles after the process described in cook books as "bottling," some still cling to the old way of putting them in the brine, and freshening when needed. When this last method is used, an oaken tub or cask should be provided; the brine should be strong enough to bear up an egg; a heaping pint of salt to one gallon of water is a good proportion; the pickles must always be kept well under the brine. In case it is desired to keep a long time before using, it is better to use even more salt, freshening before using, in weak vinegar. All such vegetables as cabbage, cauliflower, tomatoes, and the like, when used for pickling, should be perfectly fresh and crisp, and should stand at least over night in brine that will bear an egg, then drained on a sieve and pressed within a dry cloth before proceeding to the next step of adding vinegar and spices.

TO ASCERTAIN THE CARRYING POWER OF A HORSE.

Veterinary Major F. Smith, M.R.C.V.S., says:—The mean ratio of carrying power to body weight is 1 : 5·757, that is to say, it takes, speaking roughly, $5\frac{3}{4}$ lb. of body weight to carry 1 lb. on the back during severe exertion (racing excepted). The rule therefore for ascertaining the carrying power of a horse is to divide his body weight by 5·757, and, if intended for only moderate work, add to the product 28 lb. It has to be noted that the observations were made upon military horses, and it is doubtful if it would work out so accurately if applied to all horses used for the saddle.

THE LABOUR EQUIVALENT OF A FAT BULLOCK.

A New Zealand farmer sends to the *Standard* a curious comparison of the labour equivalent of a fat bullock in England and New Zealand respectively. Supposing the dead weight of the bullock to be 700 lb., it could be sold at fully 6d. per lb. in England, or £17 10s. in all, paying 2s. 6d. a day to a labourer for 140 days; while in New Zealand it would be sold at 16s. per 100 lb., or £5 12s., sufficient to pay the current wages for a farm labourer for only eighteen and a-half days, while a dinner in addition would have to provided daily for the colonial workman.

HOW TO SHARPEN A SCYTHE.

The almost universal use of mowing machines has left so little use for the old mowing scythe, that the proper method of grinding it is almost a lost art. In grinding a scythe, always hold the edge towards you, with the point nearest you, and the heel farthest away, so that the stone will grind across the blade at an angle of about 45 degrees. This makes a serrated edge, with the points

projecting toward the point of the scythe. Hence in swinging the scythe through the standing grass these fine points catch hold and sever the fibres of the stalk. If these minute saw teeth were pointing towards the heel, the tendency would be to slip over the stalk. Thus it is that when scythes are ground straight across the blade, they do not cut well. In using the whetstone, imitate the grinding, and, as the stone moves forward, pull it downward. Do not hold it too far under, but just level or flat with the blade.

HOW TO MIX FERTILISERS.

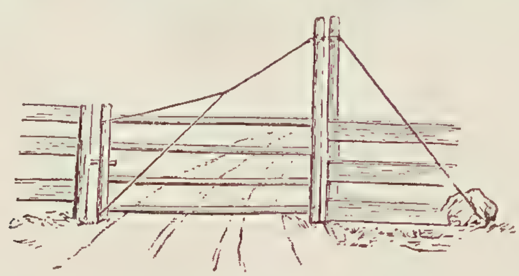
FERTILISER mixtures, uniform in quality and equal in every respect to the best factory-made fertilisers, can be made on the farm without milling machinery. A tight barn floor, platform scales, screen, shovel, and hoe are the only utensils needed. The materials having been weighed, screened, and lumps pulverised, the most bulky stock is spread in an oblong pile from 6 inches to 12 inches deep; upon its levelled top the next material is placed, and so on until all have been added like layers on a layer cake. Commencing at one end, the pile is shovelled over, the operator reaching clear to the bottom every time. The pile is then levelled up, and the operation repeated 3 times. The mixture may then be screened again if desired. In thus mixing his fertiliser the farmer knows definitely what he has purchased. Each ingredient can be tested by itself if desired, and inferior materials are not so likely to be palmed off on him. He can also vary the proportions of the ingredients to suit the requirements of varying soils.—*Farmer and Stockbreeder.*

DEVICE FOR COLLECTING CREAM.

MR. L. ARNOTT, of Cork, has patented a device for separating the milk from the cream in milk-pans. The invention is so ridiculously simple that the wonder is no one ever got hold of the idea before. The only thing in connection with it is a perforated disc, nearly the size of the milk-pan to which it is applied. It has a pair of handles which reach above the pan. This disc is placed in the milk, and when the cream has collected the disc is lifted out by the handles and the milk flows away through the holes, leaving the solid cream on the disc.

SUPPORTING FARM GATES.

THE average farm gate causes more or less trouble by sagging, even when well and strongly built. One of the most effective ways to brace up a gate that has begun to sag is to make use of a piece of stout wire, arranged as suggested in the sketch. The gate is braced to the top of its own post, and that is kept



firmly in place by a wire stay extending down to a stake in the ground, or to a big rock if one happens to lie conveniently near. There are so many uses for stout galvanised wire, No. 12, or stouter, that a supply should be kept constantly on hand. For mending fences and for making many other repairs it is exceedingly convenient.—*Australian Field.*

PATENT BITLESS BRIDLE.

THE common form of bridle in use at the present time, the chief feature of which is that the horse is controlled and guided by means of a steel bar called the bit, though a very serviceable article, has several drawbacks, which soon become apparent to those who ride or drive horses. Many horses have a habit of pulling with their mouths, a practice which, besides being bad for the horse itself, is very disagreeable to the rider or driver.

To overcome the evils of the ordinary bridle, Lieutenant-Colonel Wetherel has patented a bitless bridle, which is a simple, though certainly ingenious, arrangement. The mechanism will be easily understood from the illustrations we reproduce. The bridle is shown on the horse's head, and an enlarged section shows the manner of working.

A—The cheek strap supporting the fulcrum plate B.

C—The nose band, secured to slot on fulcrum plate B.

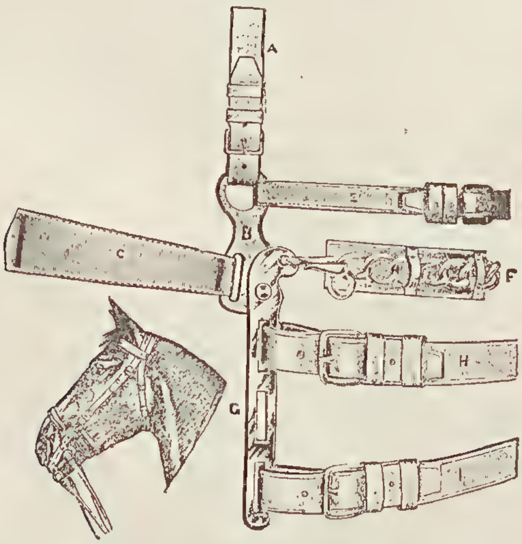
E—A small jaw strap to steady the fulcrum plate B.

F—The curb chain, to regulate adjustment, having leather underneath to protect the chin.

G—The lever rein arm, pivoted to fulcrum B. The hook which holds the regulating curb chain F, shown secured to the upper short end of rein arm G, where the leverage power is exerted.

H—Represents what is known as the snaffle rein: ridden on this, very little leverage power would be exerted, consequently the horse's head would be comparatively free.

G I—The lever rein, which exerts the requisite leverage force to stop the animal and diminish the strain on the driver's arm.



The bit, an instrument of torture to many horses, and not pleasant to any, is here entirely done away with. When the reins are pulled a considerable leverage is exerted, and the curb chain and nose band are tightened, so that the horse may be brought to a stop without tearing and tugging at his mouth. The mouth evil is entirely done away with, and when a horse finds that there is no bar in his mouth he gives up pulling. The force exerted by the new bridle may be regulated at will, for as the lever bar is lengthened the power is increased, while in riding the snaffle rein may be held so as not to put too much pressure on the horse's head. When freed of the bit and its accompanying evils, the horse carries his head in a more natural and easier manner, and no bearing rein is required. The pulling at the rein is a great relief to the driver or rider, and it is claimed that an animal can be easier kept in hand than by the ordinary means.

There is little difference in the actual method of guiding the horse, except that the rein on the side opposite to the turning should be held fairly tight, so as not to allow the lever bar on that side to rise and undo the leverage exerted on the other. The curb need not be very tight, and so leaves the head quite free and easy. Many who have tried the bridle, even with bad cases of pullers, speak of its great success and complete control of the horse.—*Farmer and Stockbreeder.*

ARE SPARROWS HARMFUL TO CROPS.

A CORRESPONDENT of the *Agricultural Economist*, London, says for the prosecution:—

If you wish for an opinion on this knotty point, I can give you one of far greater value than anything that might emanate from myself. In a leaflet lately published by Miss E. A. Ormerod, containing the testimony of many as to the character of the sparrow and the food it eats, I find it generally asserted that sparrows live on grain almost exclusively. Colonel Russell, of Stubbers, near Romford, Essex, speaking of some "experiments" he had made with sparrows, says, as quoted by Miss Ormerod, "The food in the old ones was almost all corn during the whole year; green peas were also found in them in the summer, and in May and June, when corn is scarce, a few wild seeds, chiefly of grass. No insect has been found by me in a sparrow between September and March. I have not often found one at any season in a sparrow old enough to feed itself, and have very seldom found any number of insects in one, even when corn could scarcely be got."

This authority further remarks, "To prove that sparrows are really useful, it is not enough to show that they destroy some injurious insects, but it must also be proved that in their absence other birds would not destroy them at least as effectually. This can be found out only in one way, by banishing the sparrows from a place for some years. Colonel Russell did this, leaving all birds but sparrows alone. The result was that after the almost total absence of sparrows from his garden for many years, everything seemed to do better than elsewhere, many things much better." This is crushing testimony against the poor sparrow. At any rate, this is the only conclusion that can be drawn from Colonel Russell's statements.

To this a farmer adds:—

Although a great lover of birds, and at all times willing to forgive them for inflicting a small amount of injury upon my crops, yet, I am sorry to say, I cannot soften my heart sufficiently to say a good word for the sparrow. In my opinion, this bird has scarcely one redeeming point in his character. We are assured by the highest authorities that the sparrow's daily food consists of 75 per cent. of corn; of green peas, 4; of beetles, 3; of caterpillars, 2; of insects which fly, 1; of bread, 5; and of weed seeds, 10 per cent.; and I know from my own experience that this is by no means an exaggerated estimate of his daily diet obtained at the expense of the farmer and gardener.

Let any farmer watch the sparrow sitting on a hedge swarming with caterpillars, and note if he attempts to eat a single one! According to my observation, so long as any corn is within the sparrow's reach he will not touch a single caterpillar, or indeed an insect of any kind. No, I look upon the sparrow as an unmitigated nuisance to farm crops; and while I have no wish to see him wholly exterminated, I do think that it is the duty of every farmer to see that he is not allowed to exist in too large numbers on the farms.

For the defence, "P. J." and "Naturalist" reply:—

This is one of those moot points on which, as Sir Roger de Coverley said, "Something may be said on both sides." They eat seed corn it is true, they also eat ripe corn at harvest time, but they eat insects and grubs as well. All that can be done, therefore, is to weigh the one against the other, and see, if we can, on which side the balance lies. On this point there is one thing not to

be lost sight of. It is only at certain brief periods of the year that the sparrows can attack the seed corn in the ground, or the ripe corn on the stalk, whereas the insects and the grubs are with us "all the year round." Looking at this, it would seem that the balance of evidence is in favour of their being more benefical than harmful, so that they may very reasonably be left alone, unless they increase and multiply to such an extent as to become a positive nuisance. This is never likely to happen in our country where there are so many bird's-nesting boys about, and, therefore, I venture to record it as my humble opinion that the poor little sparrow may be regarded as rather a friend than a foe. If very troublesome, encourage the boys to look after the nests in spring-time and then the sparrows will not increase too freely.

Allow me briefly to say that it has been indisputably proved that the house sparrow (*Passer domesticus*) is one of the farmer's best friends. Throughout the greater part of the year his food mainly consist of grubs, insects, and seeds of noxious weeds, and if he does eat a few grains of corn occasionally, well, he deserves it as a reward for the service rendered in clearing the land of harmful insects and noxious weeds.

The hedge sparrow, hedge warbler, shuffle-wing, or dunnock (*Accentor modularis*) does absolutely no harm to farm or garden crops. His food consists entirely of insects and their grubs.

PRESERVE THE SWALLOWS.

WHEN shall we succeed in staying the hand of sportsmen (?) who, to keep their hands in for pigeon or quail shooting, practice on the swallows?

The Board of Agriculture (England) deprecates the practice, and points out the losses resulting to agriculture owing to the decrease of the swallow, which is partly attributed to the slaughter of the birds in the South of Europe, and partly to the increase of house sparrows which drive the swallows away from their nesting places.

The Board has issued leaflets on the swallow and the spotted fly-catcher, describing the habits of these birds, and urging their preservation as friends of the farmer and gardener.

DESTRUCTION OF NOXIOUS WEEDS.

IN the February number of the *Journal* we drew attention to experiments which had been made in England by Dr. W. Somerville with a view to the complete extermination of charlock in wheat-fields, all having more or less success.

In a German agricultural paper, Dr. Schultz has published the results of experiments in the destruction of charlock with a solution of sulphate of iron, carried out by him last season, fully confirming the satisfactory conclusions derived from similar trials in France first, and later in England. He found that wild radish, as well as charlock, in wheat, barley, or oats, was killed or kept from developing seed by spraying with this solution, without harming the corn. But he recommends a 15 per cent. solution, which is just double the strength found most satisfactory by Dr. Somerville in the North of England. That is to say, he used 15 lb. of the sulphate with 10 gallons of water, spraying about 40 gallons over an acre. Other experiments showed that it was not safe to use the solution where young clovers were growing with the cereals, and that pulse and beet crops were also injured by it.

One of the Cruciferæ—a *Brassica* or Black Mustard—grows to a large extent in the wheatfields on the Downs. Specimens are occasionally sent to the Government Botanist, Mr. F. M. Bailey, and some senders ask, "What shall we do to get rid of the pest?" What will kill charlock, Mr. Bailey says, will probably kill the wild mustard. We give the remedy. Have we no one among our farmers who will take the trouble to make some simple experiments?

PREPARING BOTANICAL SPECIMENS FOR TRANSIT.

MR. F. M. BAILEY, Government Botanist, gives the following directions for collecting botanical specimens, which have to be sent by post for naming. It often happens that correspondents forward to him a flower or a few leaves, or some portion of a plant, which it is next to impossible for him to determine owing to the neglect of the sender to observe certain conditions which are here set forth:—

A botanical specimen is such a portion of a plant as may enable a botanist to determine its name, &c. Thus, of a tree or shrub, a shoot, say 6 or 9 inches long, bearing leaves, flowers, and fruit, if possible, will be sufficient. Of herbs, when small, an entire plant should be sent, collected when in flower. Of herbs of a large size, a portion of the lower (radical) leaves, and also a portion of the top, in flower or seed. All specimens should represent the typical form—not an abnormal or irregular growth, except to show such growth. After gathering, place the specimen between sheets of paper (old newspaper), and put the whole under a slight pressure; these papers should be changed for dry sheets every day for 3 or 4 days, when, if the specimens are not of a succulent nature, they will be in a fit state to forward by post, the cost of which will be, 1d. for every 2 oz. from any part of the colony; or by parcel post, the cost of which is 6d. for first lb. and 3d. for each additional lb. up to 11 lb. Parcels should be marked "Botanical Specimens Only," and addressed to the Colonial Botanist, Brisbane. Number specimens and retain duplicates.

A CURE FOR TICKS IN CATTLE.

MR. D. F. TURNBULL, Martintown, Cairns district, writes to say that he has discovered a "wrinkle" worth knowing to keep cattle free from ticks. As it is important that every light should be thrown on the subject of cattle ticks, we print Mr. Turnbull's letter. He says:—

"Of a few cows I have, one in particular seemed such a favourite of the ticks that I got tired of trying to keep her clean. She was down to skin and bone, when a neighbour, happening to see her, said she could not live above 3 days. Shortly after this, I thought of saltpetre and its effect on dead beef. I decided to try it on the cow.

"I ground a bit the size of two peas, with a little salt, and gave her this amount daily for 3 days, when half of the ticks disappeared. I then reduced the amount to one-half for the next 3 days, when I could count on my fingers the remaining ticks. After this, I gave her a bit—and still do so—the size of a pea twice a week, which keeps her in a thoroughly clean condition.

"Of course the cow put on flesh quickly, and was nearly fat in 6 weeks after the treatment began"

[This remedy, we may say, is not new. A Frenchman was travelling the colonies some time ago, who affirmed that he could cure ticks by the use of saltpetre. Mr. P. R. Gordon says that the matter was gone into by Sir Horace Tozer, and quantities of saltpetre were tried on cattle without the slightest effect. The presumption is that the cow above mentioned was just about getting clear of the ticks when the remedy was tried with such a satisfactory result. Mr. J. Irving, M.R.C., V.S., concurs in Mr. Gordon's opinion.—Ed. *Q.A.J.*]

GRAFTING TOMATOES ON TO POTATOES.

THE United States Government at the experiment stations has succeeded in grafting the tomato top on to the potato root, and strange as it may seem the growing of a crop of tomatoes does not seem to interfere with the growth of the potato, and we have no doubt that it will become common some time by this means to grow the finest tomatoes and potatoes both from the same plant.—*Exchange.*

MEAD.

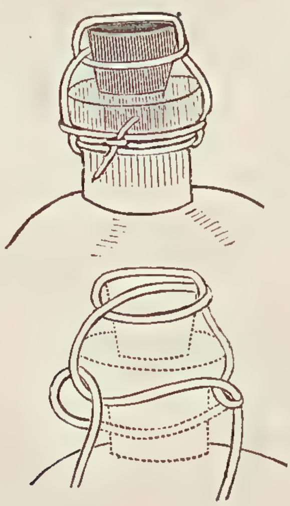
LARGE quantities of this beverage were drunk by our British forefathers. Nowadays we never hear of it, probably owing to the large consumption of cheap beer.

A writer in a home journal recommends the utilisation of low-grade honey, by turning it into this wholesome and refreshing beverage. There are many elaborate receipts given for its manufacture in bee and other books, but all recommend the use of spices, which almost destroy the taste of the honey. The simple recipe is as follows :—

Soak the cappings, or pieces of comb, after extracting, in water, and when they have yielded up their sweetness, drain the water away, and test it to ascertain the quantity of honey it contains. The proper strength will be found to allow an egg to float and about half to remain submerged. If there is too much honey in, add water; if too little, add honey. When there is a fairly large quantity of liquid it is somewhat difficult to make an accurate test. The work will be simplified by taking out, say, a quart, and adding to it water and honey, according to requirements. It is easy then, knowing the quantity of liquid in the barrel, to add a like proportion either of water or honey. When the proper degree of strength has been obtained in the manner described, boil the liquor for 20 minutes, skimming all the time. Then pour it into a pan and let it remain until the next day; then pour it into a cask and leave it. Slight fermentation will take place, after which bung tightly, and leave the barrel unmolested for 6 or 12 months.

TYING IN A CORK.

THE accompanying illustration shows how a cork may be fastened securely in a bottle and prevent it from leaking when carried about. In the upper part of



the illustration the cork is shown securely tied. In the lower part it is shown in outline. After a little experience the tying can be done with no difficulty. Cut the string about the desired length, place the middle of it on top of the cork, disposing of the ends as indicated in the lower half of the sketch. Use a stout string and you will have no difficulty with leaky bottles.—*Australian Field.*

AGRICULTURAL AND HORTICULTURAL SHOWS.

THE Editor will be glad if the secretaries of Agricultural and other Societies will, as early as possible after the fixture of their respective shows, notify him of the date, and also of any change in date which may have been decided on.

The Markets.

AVERAGE PRICES FOR APRIL.

Article.		APRIL. Top Prices. £ s. d.
Bacon	lb.	0 0 $6\frac{7}{8}$
Bran	ton	5 7 6
Butter, First	lb.	0 0 $11\frac{13}{16}$
Butter, Second	,,	0 0 8
Chaff, Mixed	ton	4 1 3
Chaff, Oaten	,,	4 11 3
Chaff, Lucerne	,,	4 5 0
Chaff, Wheaten	,,	3 0 0
Cheese	lb.	0 0 $7\frac{5}{8}$
Flour	ton	7 16 3
Hay, Oaten	,,	3 13 9
Hay, Lucerne	,,	3 10 5
Honey	lb.	0 0 2
Japanese Rice, Bond	ton	13 5 0
Maize	bush.	0 3 $10\frac{1}{4}$
Oats	,,	0 3 $7\frac{1}{2}$
Pollard	ton	5 12 6
Potatoes	,,	5 1 3
Potatoes, Sweet	,,	2 12 6
Pumpkins, Table	,,	1 12 6
Sugar, White	,,	14 10 0
Sugar, Yellow	,,	11 17 6
Sugar, Ration	,,	8 17 6
Wheat	bush.	0 3 $7\frac{1}{2}$
Onions	cwt.	0 4 $10\frac{1}{2}$
Hams	lb.	0 0 $9\frac{3}{8}$
Eggs	doz.	0 1 $4\frac{1}{16}$
Fowls	pair	0 3 $4\frac{1}{2}$
Geese	,,	0 4 $5\frac{1}{4}$
Ducks, English	,,	0 2 $9\frac{3}{4}$
Ducks, Muscovy	,,	0 4 $2\frac{1}{4}$
Turkeys, Hens	,,	0 5 $4\frac{1}{2}$
Turkeys, Gobblers	,,	0 12 $1\frac{1}{2}$

ENOGGERA SALES.

Article.	APRIL. Top Prices. £ s. d.
Bullocks	4 11 $10\frac{1}{2}$
Cows	2 13 9
Wethers, Merino	0 10 $3\frac{3}{4}$
Ewes, Merino	0 7 $0\frac{3}{4}$
Wethers, C.B.	0 11 $4\frac{1}{2}$
Ewes, C.B.	0 8 6
Lambs	0 8 $3\frac{3}{4}$
Pigs	...
Baconers	2 11 6
Porkers	1 3 6
Slips	0 8 0

Orchard Notes for June.

By ALBERT H. BENSON.

The marketing of citrus fruits is still one of the principal operations in many orchards throughout the colony, and the remarks anent this matter that have appeared in these notes for the past two months should be borne in mind and acted upon, as no matter what the quality of the fruit may be it always sells best when well packed and attractively got up, as the better it looks the better it sells.

In many parts of the colony deciduous fruit trees should be pruned during the month, and I strongly advise fruitgrowers to read my remarks on this subject which appeared in a previous issue of this *Journal*, as thorough pruning is seldom carried out, many trees being allowed to grow of their own sweet will without let or hindrance. This neglect to properly prune fruit trees is conducive to the rapid spread of many insect and fungus diseases, as when trees are allowed to grow into a dense bush it is impossible to keep them clean by means of any of the ordinary methods adopted for the eradication of disease, such as spraying, &c.; and when they are allowed to straggle all over the place, the straggling limbs are very apt to become more or less diseased.

Old neglected trees of good varieties, and of which the roots are still healthy, should be cut hard back, and all dead, broken, or badly diseased branches should be cut off, and a new head be allowed to form; but where such trees only produce inferior fruit, that is of no commercial value, they should be either destroyed, or, if wished, they may be grafted on next spring with good valuable varieties. Old neglected trees are the breeding-grounds of many diseases, and when they are of no value whatever they should be destroyed, as they are a menace and source of infection to the neighbourhood in which they are growing.

Do not be afraid to prune too heavily, as it is better to lose a crop and thereby get your tree or trees into a healthy state than to leave them in an unhealthy and unpruned condition, and get a poor crop of inferior fruit. Prune hard, and gather up and burn all prunings; do not let them lie about, but burn them up, as by doing so any diseases that may be on the wood that has been pruned off will be destroyed. Where trees are hard cut back, and only the main limbs are left, it is advisable to follow up this same pruning with a dressing that will destroy all insects or fungus pests still remaining on the tree, and for this purpose the best remedy is to paint the stems and branches with the following mixture, prepared thus:—Boil 2 lb. of sulphur and 1 lb. of quicklime in 2 gallons of water for about one hour, then add fine clay to the mixture till it is as thick as paint, and apply with a brush. Fine flour can be used in the place of the clay if desired, and will render the mixture more lasting.

Where San José, Greedy, Mussel, or Parlataria Scales are present, this method of treatment is the most efficacious, and is even better than spraying with the sulphur, lime, and salt wash mentioned in my pamphlet on spraying. This mixture is also of value for painting the stems and main branches of citrus trees covered with mosses or lichens, or attacked by White, Red, Circular Black, Mussel, or other scale insects.

Where the ground is ready, plant deciduous trees this month; do not plant too deep, and cut back hard at planting. Clean up the orchard thoroughly, and plough and leave the ground rough as soon as pruned and the prunings are burnt. Gather up and destroy all fly-infested fruit of all kinds, as the more thoroughly the fly is kept down during the winter on the coast the fewer

flies there will be to deal with in spring. Where not already done, see that pineapples are protected from frost, and keep the ground between the plants well worked in order to retain moisture, as the winter months are usually dry and the plants are liable to injury through drought. The same remarks apply to bananas, and the unripe bunches of fruit should be protected from slight frosts or cold spells by any suitable available material.

Farm and Garden Notes for June.

Farm Notes.—The partial cessation of weed growth during this month affords the farmer an opportunity to sow lucerne, rye, prairie, and other grasses. For lucerne this season of the year is most favourable for sowing, as the young plants will have ample room to grow strong unchecked by the growth of weeds. Those who propose to sow millets, sorghum, panicum, &c., should begin to get the land ready for these crops. We print the first of a series of articles on broom millet, and next month full directions will be given for the sowing and after cultivation of the plant. Oats, rye, barley, vetches, clover, tobacco, buckwheat, and field carrots and swedes may now be sown. Some advocate the sowing of early maize and potatoes towards the end of the month, but obviously this can only apply to the more tropical parts of Queensland. The land may be got ready, but in the Southern district and on the table land neither maize nor potatoes should be got in before the end of July or in August. There is always a probability of frosts during these months. Arrowroot will be nearly ready for digging, but the bulbs should not be taken up until the first frosts have occurred. Dig sweet potatoes, yams, and ginger. Sweet potatoes may be kept, should there be a heavy crop, and consequently a glut in the market, by storing them in a cool place in dry sand, taking care that they are thoroughly ripe before digging. The ripeness may be known by the milky juice of a broken tuber remaining white when dry. Should the juice turn dark, the potato is unripe, and will rot or dry up and shrivel in the sand pit. Before pitting, spread the potatoes out in a dry barn, or in the open if the weather be fine. In pitting them or storing them in hills, lay them on a thick layer of sand. Then pour dry sand over them till all the crevices are filled and a layer of sand is formed above them. Then put down another layer of tubers, and repeat the process till the hill is of the requisite size. The sand excludes the air, and the potatoes will keep right through the winter. Wheat may still be sown. It is too late for a field crop of onions. In tropical Queensland the bulk of the coffee crop should be off by the end of July. Yams may be unearthed. Cuttings of cinnamon and kola-nut tree may be made, the cuttings being planted under bell glasses. Collect divi-divi pods and tobacco leaves. English potatoes may be planted. The opium poppy will now be blooming and forming capsules. Gather tilseed (sesame), and plant out young tobacco plants if the weather be suitable. Sugar-cane cutting may be commenced. Keep the cultivator moving amongst the pineapples. Gather all ripe bananas. Fibre may be produced from the old stems.

Kitchen Garden.—Asparagus and rhubarb may now be planted in well-prepared beds or rows. In planting rhubarb, it will probably be found more profitable to buy the crowns than to grow them from seed; and the same remark applies to asparagus.

Cabbage should be planted out as they become large enough, also cauliflower, lettuce, &c.

Sow cabbage, red cabbage, peas, lettuce, broad-beans, carrots, radish, turnip, beet, leeks, and herbs of various kinds such as sage, thyme, mint, &c. Eschallots, if ready, may be transplanted, also horse-radish can be set out now.

The earlier sowings of all root crops should now be ready to thin out, if this has not been already attended to.

Keep down the weeds among the growing crops by a free use of the hoe and cultivator.

The weather is generally dry at this time of the year, so the more thorough the cultivation the better for the crops.

Land for early potatoes should now be got ready by well digging or ploughing.

Tomatoes intended to be planted out when the weather gets warmer may be sown towards the end of the month in a frame where the young plants will be protected from frost.

Flower Garden.—No time is now to be lost; for many kinds of plants need to be planted out early to have the opportunity of rooting and gathering strength in the cool moist spring time to prepare them for the trial of heat they must endure later on. Do not put your labour on poor soil. Raise only the best varieties of plants in the garden; it costs no more to raise good varieties than poor ones. Prune closely all the hybrid perpetual roses, and tie up, without pruning, to trellis or stakes the climbing and tea-scented varieties, if not already done. These and other shrubs may still be planted. See where a new tree or shrub can be planted; get these in position; then they will give you abundance of spring bloom. Renovate and make lawns, and plant all kinds of edging. Finish all pruning. Divide the roots of chrysanthemums, perennial phlox, and all other hardy clumps; and cuttings of all the summer bedding plants may be propagated.

Sow first lot, in small quantities, of hardy and half-hardy annuals, biennials, and perennials, some of which are better raised in boxes and transplanted into the open ground, but many of this class can, however, be successfully raised in the open border if the weather is favourable. Antirrhinum, carnation, picotees, dianthus, hollyhock, larkspur, pansy, petunia, *Phlox Drummondii*, stocks, wallflower, and zinnias, &c., may be sown either in boxes or open beds; mignonette is best sown where it is intended to remain.

To grow these plants successfully, it is only necessary to thoroughly dig the ground over to a depth of not less than 12 inches, and incorporate with it a good dressing of well-decayed manure, which is most effectively done by a second digging; the surface should then be raked over smoothly, so as to remove all stones and clods, thus reducing it to a fine tilth. The seed can then be sown in lines or patches as desired, the greatest care being taken not to cover deeply; a covering of not more than three times the diameter of larger seeds, and a light sprinkling of fine soil over small seeds, being all that is necessary. A slight mulching of well-decayed manure and a watering with a fine-rosed can will complete the operation. If the weather prove favourable, the young seedlings will usually make their appearance in a week or ten days; thin out so as to leave each plant (if in the border) at least 4 to 6 inches apart.

Public Announcements.

THE Editor will be glad to receive any papers of special merit which may be read at meetings of Agricultural and Pastoral Associations in Queensland, reserving, however, the right to decide whether their value and importance will justify their publication.

WE shall be pleased to receive reports of the progress of Butter and Cheese Factories and Creameries for publication.

THE *Queensland Agricultural Journal* will be supplied to all members of Agricultural and Horticultural Societies who do not derive their livelihood solely from the land, on payment, in advance, of an annual subscription of 5s.

GOVERNMENT AGRICULTURAL LABORATORY.

INSTRUCTION FOR THE COLLECTION OF SAMPLES, AND SCALE OF FEES.

GENERAL INSTRUCTIONS.

1. All analyses are carried out in their turn as they arrive at the Laboratory.
2. Should a customer wish for an immediate analysis, the fee, as provided by scale of fees below, will be increased by 50 per cent.
3. The samples may be forwarded by parcel post or by rail, either to the Under Secretary for Agriculture, Brisbane, or direct to the Chemist, Agricultural Laboratory, at the Agricultural College, Gatton; but in any case the required fee must be transmitted at the same time.
4. Analyses will be only carried out, if samples are taken strictly in accordance with the instructions issued below.

SCALE OF FEES.

	Farmers, Selectors, Gardeners. £	s.	d.
Soil—Short analysis (estimation of lime, alkalies, nitrogen, and phosphoric acid)	2	2	0
Soil and Subsoil—Short analysis	3	3	0
Soil—Complete analysis	4	4	0
Water—Analysis	3	3	0
Manures—			
Complete analysis	2	2	0
Nitrogen only	0	7	6
Potash only	0	7	6
Phosphoric acid sol.	0	15	0
Phosphoric acid insol.	0	15	0
Food Stuffs—			
Complete analysis	2	2	0
Water only	0	5	0
Albuminoids	0	10	0
Oil or fat	0	7	6
Ash	0	5	0
Fibre	0	7	6
Sugar-cane, sugar-beet, megass—Analysis of	1	1	0
Sugar, massecuite, jelly, molasses	1	1	0
Milk, butter, cheese—Complete analysis	1	0	0
Tanning materials (tannin estim.)	1	0	0
Soaps	1	10	0
Limestone, cement, clay, &c....	3	0	0

INSTRUCTIONS FOR TAKING AND COLLECTING OF SAMPLES.

SOILS AND SUBSOILS.

To obtain a fair average sample of the soil of a block of land, as near as possible, equal quantities of soil are taken from various parts of the fields.

A sketch plan of the field, paddock, or block of land on which the samples were taken should accompany the samples, and the spots where samples are taken are marked on this plan and numbered. This sketch plan should also indicate position of roads, creeks, gullies, ridges, general fall of the land, &c.

Should the soil in various parts of the block show a very marked difference, it will be necessary to divide the block into two, rarely in more, parts. Should the different soil occur only in a small patch, this sample may be left out.

Not less than three samples should be taken in each section. A greater number is to be preferred, as a better average will be obtained.

At the places chosen for the taking of the samples the surface is slightly scraped with a sharp tool, to remove any surface vegetation which has not as yet become part of the soil.

Vertical holes from 10 to 18 inches square are dug in the ground to a depth of 2 feet 6 inches to 3 feet.

The holes are dug out like post-holes; an earth-auger facilitates the operation considerably, and the holes may be trimmed with the spade afterwards.

Careful note of the appearance of the freshly cut soil and subsoil should be taken. The depth of the real soil, which in most cases is easily distinguished, is also measured and noted for each hole. Note how deep the roots of the surface vegetation reach into the soil. If the soil changes gradually into the subsoil, as is the case in some places where the soil is of very great depth, this line of division is guessed approximately, or it is best to take the soil uniformly to a depth of 12 inches.

With a spade a slice of soil is now cut off and put on to a clean bag. The same is done with the subsoil, and the slice is taken from where the soil ends (or 12 inches) to the bottom of the hole, and this subsoil placed on another bag. Stones over the size of a pea may be picked out, the rough quantity of such stones estimated, and a few enclosed with the samples. Fine roots must not be taken out from the soil samples. The same operation is repeated at the other places chosen. Careful note and description in each hole, as numbered and marked on plan given, and the samples of soil collected on the one bag thoroughly mixed by breaking up any large clods, and about 10 lb. of the mixture put into a clean canvas bag, which is securely tied up and labelled. The same is done with the samples of subsoil collected on the other bag.

All the samples collected are afterwards placed into a wooden box.

It is important to use clean bags and clean boxes, and also that the samples should not be left in the neighbourhood of stables or manure heaps. A short description of the land must accompany the samples and the sketch plan.

In the case of cultivated land, state how long the land was under cultivation, what crops were chiefly grown, result of such crops, was any manure applied, when, and what sort, and in what quantities per acre. In the case of virgin soil, state if the land was heavily timbered or not, ringbarked, if scrub or forest land, what sort of timber was chiefly growing on the land. In all cases a description of the neighbouring land, outcropping rocks, &c., are of great value. Also state if the land is naturally or artificially drained or not; describe the land as regards its position to hills, roads, creeks, ridges, &c. Only by adhering strictly to these instructions, and by giving minute details, benefit can be derived from the soil analyses.

WATER.

It is best to collect and forward samples of water for analysis in stoppered glass bottles, generally known as Winchester quarts.

The bottles have to be perfectly clean, and stoppers must fit well. Corks should be avoided, but if used must be new and well washed with the water before being used for closing the bottle.

When taking waters from taps, pumps, bores, the water has to be allowed to run for a while before taking the sample. When taking the water out of a well, pond, or river, the bottle is completely immersed, but care has to be taken not to disturb the mud or sediment at the bottom of the water. Before the sample is actually collected, the bottle is rinsed three times with the water, filling each time about one-third full. The bottle is then filled within about 1 inch from the top; the stopper is inserted and securely tied down with a clean piece of linen or calico.

The stopper must not be fastened or luted with sealing-wax, paste, plaster of paris, &c.

MANURES.

When taking samples of artificial manures out of bags, the sample must be taken from different bags and at different places of the bag and not only from the top, or the bags before being used are emptied on a heap and mixed up well and the sample then taken. About 1 to 2 lb. put into a clean bag should be forwarded for analysis.

FOOD STUFFS.

It is always important to obtain good average samples, and this can only be done by great care in taking the samples from different places, mixing well, and taking a small part of the mixture. This method would apply to any dry food-stuff—as grains of any kind, peas, beans, chaff, pollard, meal, &c. For the analysis of green foods—as green hay, sorghum, silage—it is best to make a mixture of the sample by passing it through a chaffcutter, and by taking an accurately weighed quantity—say 1 lb. This quantity may then be dried in the sun, taking care that nothing is lost, and when dry put in a bag and forwarded for analysis. The green samples may also be forwarded without drying in fruit-preserving jars.

To collect information about value of *green manures*, it is best to plot out exactly one square yard in the field covered with the plant, not picking out a position where the growth is very heavy or poor, but about a fair average. Four pegs are driven into the ground at the four corners, and string stretched between them; with a sharp spade all the plants are cut along the strings, so as to get really the growth of one square yard. The plants are all collected and accurately weighed, passed through a chaffcutter, and the sample for analysis taken as above described. In many cases the roots may be also pulled out, weighed separately, and a sample forwarded.

The samples have to be accompanied by a description of the crop—when planted, how old when cut, if the land was manured or not, weight of crop per acre or per square yard, and weight of the sample forwarded when in its green state. In the case of green manures it is generally best to take the samples at the same time when ploughed under, just after flowering.

"THE DISEASES IN PLANTS ACT OF 1896."

Department of Agriculture,
Brisbane, 19th January, 1899.

HIS Excellency the Governor, with the advice of the Executive Council, and in pursuance of the provisions of "*The Diseases in Plants Act of* 1896," has been pleased to make the following further Regulations.

J. V. CHATAWAY.

THE FUMIGATION OF FRUIT FOR EXPORT.

1. Any one who wishes to erect a chamber or building for the fumigating of fruit is requested to give notice to the Under Secretary for Agriculture, who will take steps to see that the chamber or building is properly constructed.

2. When it is required to fumigate fruit for export, twenty-four hours' notice must be given to the said Under Secretary or such other officer as may be duly authorised to accept such notice.

3. The operation of fumigating must be conducted under the control of an officer authorised by the Minister for Agriculture.

4. The fumigating chamber may be made of any convenient size or material, the essential point being that it shall be capable of being closed absolutely airtight, and provided with a flue-pipe in the roof which can be opened or closed to allow of the escape of the gas after fumigation. The flue must be provided with a box or chamber to contain caustic soda or potash to destroy the gas.

The fumigating chamber must be provided with a shutter or sliding panel in the lower portion of the door or wall.

Door, flue, and shutter must all be made to close absolutely airtight.

DIRECTIONS FOR FUMIGATING WITH HYDROCYANIC ACID GAS.

Proportions of Ingredients.—For every 150 cubic feet of room take 1 ounce of cyanide of potassium, 5 fluid ounces sulphuric acid, 10 fluid ounces water.

Having placed the fruit to be fumigated in the chamber, see that the flue and the shutter in the door or lower part of all are properly closed.

The acid is then to be diluted in the following manner:—The whole of the water is placed in a shallow china or glazed earthenware vessel, such as an ordinary wash-hand basin. (Metal vessels are inadvisable unless they are leaden ones.) The sulphuric acid is next poured on to the water in a thin stream, stirring the while with a stick. Do not mix by adding the water to the acid.

The basin containing the acid thus diluted (which should be allowed to cool) is now placed in the fumigating chamber, and the cyanide of potassium is emptied into it.

The gas is given off with great violence, and the door should be immediately closed.

The whole is now to be left to itself for one hour. At the end of this time the shutters in the flue and in the door are opened, and the draught produced drives the gas out of the chamber. At the end of half an hour the door is thrown open, and if the draught has been effective there should be hardly any trace of hydrocyanic gas recognisable. The chamber may be left in this condition for another ten minutes or a quarter of an hour. The fruit is now to be moved and allowed to remain in a well ventilated place, preferably out of doors, for another half an hour. Samples of fruit will be examined from time to time by the entomologist.

Caution.—As hydrocyanic acid gas is most deadly in its effects on animal life, the greatest care must be taken in its use.

Department of Agriculture,
Brisbane, , 18 .

This is to certify that has treated cases of citrus fruit with hydrocyanic acid gas for one hour, under my supervision. These cases have been branded "Crown" over "Passed."

Shipping marks:
Per S.S.:
Consigned to:

Department of Agriculture,
Brisbane, 26th January, 1899.

THE following Proclamation by His Excellency the Governor of New South Wales is published for general information.

J. V. CHATAWAY.

NEW SOUTH WALES, to wit.
(L.S.)
HAMPDEN,
Governor.

PROCLAMATION.

By His Excellency The Right Honourable HENRY ROBERT, VISCOUNT HAMPDEN, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

WHEREAS the Governor is empowered by Section 9 of the "Vegetation Diseases Act, 1897," from time to time, by Proclamation in the *Gazette*, to declare any fungus or vegetable parasite whatever to be a fungus within the meaning of the said Act: Now, therefore, I, HENRY ROBERT, VISCOUNT HAMPDEN, the Governor aforesaid, with the advice of the Executive Council, do, by this my Proclamation, declare Black Spot (*Fusicladium*) to be a fungus within the meaning of the said Act.

Given under my Hand and Seal, at Government House, Sydney, this twenty-second day of December, in the year of our Lord one thousand eight hundred and ninety-eight, and in the sixty-second year of Her Majesty's reign.

By His Excellency's Command,

JOSEPH COOK.

GOD SAVE THE QUEEN!

LIST OF AGRICULTURAL, HORTICULTURAL, AND PASTORAL SOCIETIES AND ASSOCIATIONS IN QUEENSLAND.

Postal Address.	Name of Society.	Name of Secretary.	Date of Show.
Allora ...	Central Downs Agricultural and Horticultural Association	J. H. Buxton... ...	
Avondale ...	Avondale Farmers' and Planters' Association	N. J. Mikkelsen ...	
Ayr	Lower Burdekin Farmers' Association ...	Winsor H. Wilmington	
Beaudesert ...	Logan and Albert Pastoral and Agricultural Society	M. Hinchcliffe ...	23 June
Beenleigh ...	Agricultural and Pastoral Society of Southern Queensland	Wilson Holliday ...	15 Sept.
Biggenden ...	Biggenden Agricultural and Pastoral Society	Charles H. Peppin ...	29 June
Birthamba ...	South Kolan Agricultural and General Progress Association	G. W. Nixon ...	
Blackall ...	Barcoo Pastoral Society	F. Clewett	
Boonah ...	Fassifern and Dugandan Agricultural and Pastoral Association	J. A. McBean ...	18 and 19 May
Bowen ...	Pastoral, Agricultural, and Mining Society ...	J. E. Smith	17 Aug.
Bowen ...	Preston Farmers' Association	R. A. Foulger ...	
Bowen ...	Proserpine Farmers' and Settlers' Association	G. W. Pott	
Brisbane ...	Horticultural Society of Queensland	J. F. Bailey	— Oct.
Brisbane ...	Moreton Agricultural, Horticultural, and Industrial Association	J. Duffield	
Brisbane ...	Queensland Acclimatisation Society	E. Grimley	
Brisbane ..	Queensland Fruit and Economic Plant Growers' Association	G. K. Seabrook ...	
Brisbane ...	National Agricultural and Industrial Association of Queensland	H. C. Wood	10, 11, and 12 Aug.
Brisbane ...	Queensland Stockbreeders' and Graziers' Association	F. A. Blackman ..	
Brisbane ...	United Pastoralists' Association	Fredk. Ranson ..	
Bundaberg ...	Bundaberg Agricultural and Pastoral Society	A. McIntosh... ..	12, 13, and 14 Oct.
Bundaberg ...	Bundaberg Horticultural and Industrial Society	H. E. Ashley... ...	
Bundaberg ...	Woongarra Canegrowers' and Farmers' Association	H. Cattermull ...	
Burpengary...	Burpengary Farmers' Association	C. H. Ham	
Caboolture ...	Caboolture Farmers' Association	G. Mallet	
Cairns ..	Barron Valley Farmers' and Progress Association	W. F. Logan... ...	
Cairns ...	Cairns Agricultural, Pastoral, and Mining Association	A. J. Draper... ...	28 and 29 Sept.
Cairns ...	Hambledon Planters' Association	E. Whitehouse ...	
Charleville ..	Centra Warrego Pastoral and Agricultural Association	A. J. Carter	25 and 26 May
Charters Towers	Towers Pastoral, Agricultural, and Mining Association	W. Tilley	
Childers ...	Isis Agricultural Association	H. Epps	
Childers ...	Childers Progress Branch, Isis Agricultural Association	N. Rosenlund ...	
Childers ...	Doolbi Mill Branch, Isis Agricultural Association	W. T. H. Job ...	
Childers ...	Childers Mill Branch, Isis Agricultural Association	H. Epps	
Clermont ...	Peak Downs Pastoral, Horticultural, and Agricultural Society	F. Leysley	
Clermont ...	Peak Downs Dairymen and Settlers' Association	A. G. Pursell ...	
Cooktown ...	Cook District Pastoral and Agricultural Society	W. R. Humphreys ...	
Cordalba ...	Cordalba Farmers' Association	B. Goodliffe	
Currajong ...	Currajong Farmers' Progress Association ...	Wm. Howard ...	
Cunnamulla	South Warrego Pastoral Association	J. Winward	
Degilbo ...	Degilbo Farmers' Progress Association ...	F. A. Griffiths ...	22 and 23 June
Gayndah ...	Gayndah Agricultural and Horticultural Association	J. C. Kerr	
Gayndah ...	Mungore Farmers' Association...	J. M. Robinson ...	

AGRICULTURAL AND HORTICULTURAL SOCIETIES—*continued.*

Postal Address.	Name of Society.	Name of Secretary.	Date of Show.
Gin Gin ...	Pastoral and Agricultural Society of Gin Gin	E. K. Wollen ...	
Gladstone ...	Gladstone Pastoral and Agricultural Association	W. J. Manning ...	
Gooburrum, Bundaberg	Gooburrum Farmers' and Canegrowers' Association	W. J. Tutin	
Goondiwindi	MacIntyre River Pastoral and Agricultural Society	A. Gough	
Gympie ...	Agricultural, Mining, and Pastoral Society	F. Vaughan	14 and 15 Sept.
Gympie ...	Gympie Horticultural Society	W. G. Ambrose ...	
Halifax ...	Herbert River Farmers' League	Alfred Henry ...	
Helidon ...	Helidon Scrub Farmers' Progress Association	M. Morgan	
Herbert River	Halifax Planters' Club	H. G. Faithful ...	
Herbert River	Macnade Farmers' Association...	E. C. Biggs	
Herbert River	Ripple Creek Farmers' Association	J. W. Grimes ...	
Herberton ...	Mining, Pastoral, and Agricultural Association	John M. Hollway ..	3 and 4 April
Hughenden...	Hughenden Pastoral and Agricultural Association	W. H. Mulligan ..	8 and 9 May
Ingham ...	Herbert River Farmers' Association	...	
Ingham ...	Herbert River Pastoral and Agricultural Association	P. S. Cochrane ...	3 Sept.
Ipswich ..	Ipswich and West Moreton Agricultural and Horticultural Society	P. W. Cameron ...	6 Oct.
Ipswich ...	Queensland Pastoral and Agricultural Society	Elias Harding ...	1 and 2 June
Kandanga (near Gympie)	Kandanga Farmers' Association	N. Rasmussen ...	
Kolan ...	Kolan Canegrowers' and Farmers' Association	C. Marks	
Laidley ...	Lockyer Agricultural and Industrial Society	John Fielding ...	26 and 27 July
Loganholme...	Logan Farming and Industrial Association ...	F. W. Peek	
Longreach ...	Longreach Pastoral and Agricultural Society	J. P. Peterson ...	12 April
Lucinda Point	Victoria Farmers' Association	W. S. C. Warren ...	
Mackay ...	Agricultural, Pastoral, and Mining Association	F. Black	
Mackay ...	Pioneer River Farmers' Association	E. Swayne	28 and 29 June
Maryborough	Maryborough Horticultural Society	H. A. Jones	
Maryborough	Wide Bay and Burnett Pastoral and Agricultural Society	G. Willey	5, 6, and 7 July
Miallo ...	Miallo Progress Association	E. F. Welchman ...	
Milbong ...	Milbong Farmers' Association	T. R. Garrick ...	
Mitchell ...	Mitchell and Maranoa Pastoral, Agricultural, and Vinegrowers' Association	H. J. Corbett ...	
Mosman River	Mosman River Farmers' Association	..	
Mount Mee...	Mount Mee Farmers' Association	R. Thomas	
Mount Morgan	Mount Morgan Mining, Agricultural, Poultry, Pastoral, and Horticultural Society	G. Orford	
Mount Morgan	Mount Morgan Agricultural, Pastoral, and Poultry Society	Thos. W. Walker ...	
Mulgrave ...	Mulgrave River Farmers' Association ...	Thos. Swan	
Nerang ...	South Queensland and Border Pastoral and Agricultural Society	W. J. Browne ...	
North Isis ...	North Isis Canegrowers' Association	W. J. Young ...	
Pialba ...	Pialba Farmers' Association	J. B. Stephens ...	
Pinbarren ...	Pinbarren Agricultural and Progress Association	H. Armitage, senr. ...	
Rockhampton	Central Queensland Farmers' and Selectors' Association	T. Whitely, Coowonga	
Rockhampton	Central Queensland Pastoral Employers' Association	G. Mackay	

AGRICULTURAL AND HORTICULTURAL SOCIETIES—*continued.*

Postal Address.	Name of Society.	Name of Secretary.	Date of Show.
Rockhampton	Central Queensland Stockowners' Association	R. R. Dawbarn ...	
Rockhampton	Rockhampton Agricultural Society	R. R. Dawbarn ...	10 and 11 May
Roma ...	Western Queensland Pastoral and Agricultural Association	H. K. Alford ...	25 and 26 July
Roma ...	Yingerbay Farmers' Association	F. E. Glazier... ...	
Rosewood ...	Farmers' Club	P. H. Adams... ...	25 Aug.
Springsure ...	Queensland Pastoral Society	G. R. Milliken ...	
Stanthorpe ...	Border Agricultural, Pastoral, and Mining Society	Geo. Simcocks ...	
Stanthorpe ...	Stanthorpe Horticultural and Viticultural Society	R. Hoggan	
St. George ...	Balonne Pastoral and Agricultural Association	T. M. Cummings ...	
Tinana ...	Tinana Fruitgrowers' and Farmers' Association	Chas. Parke	
Toowoomba	Darling Downs Horticultural Association ...	H. Hopkins	
Toowoomba	Drayton and Toowoomba Agricultural and Horticultural Society	H. Symes	
Toowoomba	Royal Agricultural Society of Queensland ...	F. Burtt	2, 3, and 4 Aug.
Townsville ...	Townsville Pastoral, Agricultural, and Industrial Association (formerly North Queensland Pastoral and Agricultural Association)	J. N. Parkes	
Wallumbilla	Wallumbilla Farmers' Association	P. W. Howse ...	
Warwick ...	Eastern Downs Horticultural and Agricultural Association	J. Selke	
Wellington Point	Wellington Point Agricultural, Horticultural, and Industrial Association	F. W. Wort	21 June
Woombye ...	Woombye Fruitgrowers' Association	P. S. Hungerford ...	
Woowoonga	Woowoonga Scrub Farmers' Association ...	H. B. Griffiths ...	

BURSARIES.—JUNE EXAMINATIONS.

Department of Agriculture,
Brisbane, 25th April, 1899.

BURSARIES, QUEENSLAND AGRICULTURAL COLLEGE.

An examination will be held on the 17th June next in Brisbane and elsewhere, as may be decided upon, according to the localities in which the candidates reside, for 4 bursaries at the Queensland Agricultural College. These entitle the holders to free board and instruction as resident students, and are tenable during good behaviour for 3 years. Candidates must be not less than 16 nor more than 18 years of age on the 30th June, 1899.

Applications for examination must reach the Under Secretary for Agriculture not later than the 15th May next, and must be accompanied by (1) a certificate of birth; (2) that the applicant has resided for two years in Queensland, or that his parents have resided here for three years preceding the examinations—this certificate to be attested by a magistrate; (3) a medical certificate that he is of sound constitution and in good health.

The examination will cover the following subjects:—Reading, writing, arithmetic, English composition, geography, optional subjects, elements of agriculture.

Further particulars on application to the Under Secretary.

J. V. CHATAWAY.

By Authority: EDMUND GREGORY, Government Printer, William street Brisbane.